SUPPLEMENT.

The Mining Journal,

RAILWAY AND COMMERCIAL GAZETTE:

FORMING A COMPLETE RECORD OF THE PROCEEDINGS OF ALL PUBLIC COMPANIES.

No. 1811.—Vol. XL. LONDON, SATURDAY, MAY 7, 1870. STAMPED .. SIXPENCE. UNSTAMPED. FIVEPENCE

Original Correspondence.

COAL MINING IN THE OLDHAM DISTRICT, LANCASHIRE.

The Oak, Chamber, and Chadderton Collieries, belonging to Messrs. Leeses, are situated near Hollinwood and Oldham; and the Fairbottom Collieries, belonging to Messrs. Leeses and Booth, are situated near Ashton-under-Lyne. The royalties are of great extent; a large proportion, both of the surface and minerals, belongs to Messrs. Leeses. The whole are under the management of Mr. Booth.

There are two pits in operation at the Oak Colliery, both downcasts, near together—the Albert and Victoria. The Albert Pit is divided by brattice, for pumps and raising coal. The pumping-engine is a Cornish, 80½-in. cylinder, 10-ft. stroke, equal beam, 28 lbs. pressure of steam, worked expansively, and was built in 1846 by Mr. Fairbairn. It raises water, in four lifts, from the depth of 260 yds.; the lowest is a 17-in. bucket-lift, 50 yds.; the three above are ram-lifts, each 17 in. in diameter, and 70 yards in length. The engine goes 3½ strokes per minute, day and night; four double-tubed boilers supply it with steam. The winding-engine at the same pit has a 22-in. horizontal cylinder, 4-ft. stroke, two 6-ft. drums for flat wire-ropes, and on second motion. It raises coal from the Black Mine; depth 250 yards, one tub in each cage. A beam condensing engine, on second motion, at the top of this pit, hauls from a down-brow in the Black Mine, 400 yards in length, using one rope. At the Victoria Pit, a 30-in. vertical engine winds coal; stroke 6 ft., acting with slide-blocks direct to the drums placed above—these are 10 ft. in diameter, for flat wire-ropes. It raises from the Black Mine two 8-cwt. tubs in each cage, in two decks: 400 tons of coal have been raised here in a day. The wood guides in this pit have been in use twenty-three years. The pit has been sunk lower 66 yards to the Bent Mine, which is being opened out, and coal raised at intervals. There are two boilers to each winding-engine; two are plain, one is Lancashire, and the other, 8 ft. in diameter, has two tubes in front, connected to a combustion chamber, and seven tubes proceed from that to the end of the boiler. A pressure of 35 lbs. is maintained in these. The Black Mine is separated underground into large and mixed coal: it is an excellent house coal, and is sent to Manchester principally for this purpose by canal. The coal is not screened. Part of it is taken away by carts; the greater proportion is taken to the top of a self-acting incline by means of an endless chain. On the incline 16 tubs are sent down at once, on two platform carriages, and afterwards tipped into canal boats.

At the Chamber Colliery No. 1 pit is used as an upcast for the Oak pits; No. 2, a downcast, near it is standing; No. 3 pit, 10 feet in diameter, is used as an upcast for No. 4, near it, having a winding-engine at the top for raising or lowering men; No. 4 pit is the only one of these in operation, and is about one mile distant from the Oak Pits. The winding-engine has two 32-in. horizontal cylinders, 4½-ft. stroke, direct acting, Cornish valves, two 11-ft. drums for flat wire-ropes, and two Lancashire boilers, 30 lbs. pressure. It raises four 8-cwt. tubs in each cage, in two decks, wood guides. No. 4 pit is 430 yards deep, 12 ft. in diameter, walled throughout, is sunk below the Royley seam about 30 yards, and by a cross measure drift from the bottom of the pit westward, 200 yards in length, that coal is reached. Levels extend in this seam about 1500 yards northward, and nearly as much southward. The north levels are now standing; they are not intended to be extended further, but the coal in that district will be got by the Stockfield Pits, which are now in preparation. This coal will have to be won by an under level drift from the latter pits, so as to reach the seam on the dip side of a fault of 60 yds. An examination of an intermediate district of workings from the north levels shows that the dip is nearly west, 1 in 6. There are three north levels—one intake, two returns. From these three places to the rise have been driven; the middle one is the jig-brow, or self-acting incline. These are each 12 yards wide, the road being formed in the middle, and the remainder packed on each side. This incline was 400 yards long; it is being worked downwards, and is now only 320 yards in length. Ten other levels were driven northward from the jig-brow, each 5 yards wide, packed on one side only, so as to form two airways—intake and return. These levels are 40 yards apart, and have been extended about 300 yards northward; they are at present being worked back. In driving these levels out a communication is made between them every 50 yards, by places 12 yards wide, which relieves the temporary pack airways. The levels having been driven thus to their limits, the coal between each is worked backward by 12-yard stalls or "works" driven to the rise from one to the other; a double road is laid in the middle of each work, by which the coal is jigged down, a chain for this purpose merely passing round a prop. An airway is maintained on each side of the works as the packing is built. There are four colliers in each work, who build the packing, and fill the coal; a wagoner is employed to take the coal to the jigs. Three of the top levels are worked back, the others are in process of working, one 12 yards behind the other successively. Provision is made for taking a current of air, not only by the side and along the face of each work, but also through the abandoned air-roads and levels left behind, which can be done here without difficulty, as the roof is strong, and these places are found to remain open a considerable time, and thus currents of air are forced through them.

SECTION OF THE ROYLEY SEAM IN THIS DISTRICT.

	Ft.	In.	
Metal roof good.			
1.—Mixture of coal and shale	1	8	Taken down for packs.
2.—Clean coal	2	10	
3.—Bass	2	0	Cut in horse-roads.
4.—Under clay and bass.			

The holing is made at the bottom of the clean coal, and the pressure brings it down; powder is not used. Davy lamps are used by the colliers. The coal is of a soft quality, and is suitable for house fires; it is used also at the cotton-mills in the neighbourhood. The jig-brow, before referred to, 320 yards long, has a 4½-ft. metal horizontal wheel at the top, and ½-in- steel-rope passes twice round the sheave; six wagons are run at once. The wagons are run not only from the top but also from an intermediate level, about half-way down. This is managed by having a loose rope on one side, between the top and the intermediate landing, which is attached to the main rope at the top; a journey can thus be sent down from the intermediate landing to the bottom. When a second journey is sent down from the same point the rope is in the same position as it was at the commencement, and when the loose rope is disconnected the wagons can be sent from the top again. Each level requires a separate jig of its own, and generally the produce from two or three levels comes to one point on the main jig. The Royley seam is identified with the Arley seam of the Wigan district; it is here less productive of fire-damp than in Wigan, but great attention seems to be given to ventilation at this colliery, in maintaining airways in the working places, and ventilating the worked-out parts. The consequence of this system is that no accidents have occurred here for many years. The ventilating agent is the heated column in the upcast; there are two furnaces, each 4 ft. wide, 6 ft. in length, fed with fresh air. The returns pass into the upcast clear of the flame of the furnaces: 60,000 cubic feet of air per minute circulates through the workings of the mine; 5000 cubic feet of air per minute is supplied to the furnaces: making a total of 65,000 cubic feet. There are five horses employed in hauling underground in No. 4 pit. About 150 tons of coal per day is raised. Large and mixed coal is separated underground at the same price. The coal is not screened at bank; it is tipped into carts, and sent to the cotton factories principally. Water is raised from the bottom of the pit by a tank at nights occasionally. The Little Mine, Black Mine, and Bent seams are worked out at Nos. 3 and 4 pits; the Great Mine is partially worked. All these have been worked on the same principle as the Royley seam. The Higher Bent and Lower Bent are the most productive of gas, and the Royley seam ranks next in that respect.

LIST OF THE PRINCIPAL SEAMS FOUND IN ONE OF THE CHADDERTON PITS.

	Depth from surface.	Thickness of coal.		Names at Ashton.
Great Mine ......Yards	92	3ft. 0in. in 3 seams..		Great Mine.
Little Mine	112	1	9	Smithy coal.
Black Mine	137	3	6	Black Mine.
Higher Bent Mine	187	1	10	Two-feet or Cannel.
Lower Bent Mine	197	2	3	Peacock.
Neddy Mine	286	2	0	New Mine.
Royley Mine	417	2	10	—

The new mine at Ashton was supposed to be identical with the Royley seam at Chadderton, but the recent sinking at Hurst, commencing above the new mine, has proved the Royley seam at a corresponding depth as found under the Neddy Mine at Chadderton.

At Chadderton Colliery there are three pits from which coal is raised—New Engine, Denton-lane, and Ferneyfield, all downcasts. The upcast for the two former is the Railway Pit, at Denton-lane. Also at Stockfield one pit is sunk 340 yards to the Royley seam, and the upcast is now being sunk. A 26-in. horizontal cylinder engine is erected here for winding. At New Engine Pit a 24-in. beam-engine is used for winding; it has a compensating conical drum for round ropes. At Denton-lane Pit a 26-in. horizontal engine is used for winding, and a pair of 20-in. horizontal engines haul from a down-brow 400 yards long. At Ferneyfield 500 gallons of water is raised per minute by two engines. One pumping-engine has two 16-in. horizontal cylinders, non-condensing, it pumps from the depth of 200 yards in two lifts, 14-in. buckets, 100 yards each. Another compound pumping-engine, 21-in. and 32-in. condensing cylinder, pumps in four lifts from 200 yards deep, all 12-in. buckets. There is also at this place a 24-in. beam winding-engine, and a 12-in. horizontal engine at the top, for hauling from a down-brow in the Black Mine. An 18-in. horizontal engine, placed in the Black Mine, hauls from a down-brow in the Bent Mine. A 9-in. vertical engine is used as a steam capstan.

At Fairbottom Colliery a 70-in. Cornish engine is used for pumping, 8-ft. stroke, equal beam: it works five bucket-lifts from the new mine, depth 230 yards, all 12-in. buckets. Coal is raised at five places. At Wood Park there is a downcast and upcast; coal is raised at the former by an engine of two 26-in. horizontal cylinders. The Dock Pit is an upcast; an 18-in. beam-engine is erected at the top. At Rocher there are two downcasts, at each of which coal is raised by a beam-engine, and one upcast. At Broad Oak Pit a 28-in. beam-engine raises coal, and an engine at the top is used for hauling underground. At Hartshead a down-brow from the surface is the entrance to the mine, and a pit is used as an upcast. An engine of two 22-in. horizontal cylinders hauls from the slope; it pumps also.

The total quantity of coal produced from the Chamber, Chadderton, and Fairbottom Collieries is about 1100 tons per day. The ventilation is effected in every case by furnaces. These are preferred, as being more reliable in their action, and when the furnaces are supplied with fresh air one objection to them is removed. Only one of the pits under description has tubbing inserted—the Ferneyfield upcast. The pit passed through a quicksand at the top; over 20 yards of tubbing was inserted thirty years ago. It is not cased or protected in any way, and when tapped has been found to be quite sound.

GOVERNMENT INSPECTORS OF MINES, AND CERTIFIED COLLIERY OFFICERS.

SIR,—As this question, which is certainly of great importance, is occupying so much public attention at present, both of colliers and colliery owners, and as the influential theorists are endeavouring with their utmost exertions to put the right men in the right place, and to re-arrange and remedy the present deficient and condemned system by legislative and other expediency, I should like to ask the question through the Journal what is to constitute the tribunal of examination from which efficient and qualified officers are to receive their "certificate of competency?"

I am afraid the court of authorised ones will pertain too much of theory, and lack the most essential property—*real practical knowledge;* and, as like begets like, the imagined remedy will ultimately be worse than the disease, for it is only to such men as Mr. George Elliot, who really do possess such valuable practical knowledge, that we can look to as being able to judge of men being competent, and capable of carrying out the requirements of such an office. The "certificate of competency" would be no security for lack of experience; the underground officers must be trained up in the pit, they can never come direct from college, the professional and scientific are not the proper men, nor even are such as Mr. G. Overton. The practical man can do without the suggestions of the theorist, but the reverse is not able to go on; let those *pen*-men take the charge of an extensive colliery without the practical man to guide him, and what would be the result?

It is all very well to appoint the professional, but even *he* must have the practical man to guide him and do the work for him—but who gets the money? Anyone can come and find fault, and assert the incompetency of the manager, when the thing has gone wrong; let them go before, and explain the cause and deficiency, and how those might be reasonably avoided. I am inclined to say, with the colliers that if the colliery were properly examined by *practical men* I am convinced we should have increased security to those employed. Another remark which I think is applicable, more especially to the Yorkshire practical men; when a master has obtained a competent practical man he does not place that confidence in him that he ought to do, and give him the power to act as he would the man from the professional ranks, and would find fault with the practical man for laying out 1*l.* where the other would lay out 20*l.*, and at the same time justifying the latter for carrying out what the former had suggested over and over again. These are extraordinary facts, which the writer has witnessed over and over again during the 42 years he has spent in collieries, which is the only schooling he has had, and probably these remarks are for want of better information. In conclusion, I wish to add that I should feel myself much safer under the guidance of one of those old colliers entrusted with the superintendence of a colliery than if in the hands of Mr. Bruce, the framer of the impending Bill, as viewer, even with Mr. G. Overton as deputy.

ONE OF THEM.

ON VARIOUS MODES OF WORKING COAL.

SIR,—In an article in the Supplement to the *Mining Journal* of April 23 the writer, quoting from Mr. Fowler's paper on this subject, states that a cubic foot of sandstone weighs 156 lbs.; of shale, 160 lbs.; and of coal, 82 lbs. The weight of shale given appears too much; the average weight of sandstone, shale, and coal may be assumed to be 144 lbs. per cubic foot; this will give a pressure of 1 lb. per square inch for every foot in depth, consequently coal *in situ* at the depth of 2000 ft. will have a pressure upon it from the superincumbent strata of 2000 lbs. per square inch, and at the depth of 4000 ft., or 1333 yards, a pressure of 4000 lbs. per square inch would be sustained. The crushing weight for ordinary bituminous coal is stated to be 2000 lbs. per square inch, so that even at the depth of 2000 ft. the limit is arrived at where coal would bear its crushing weight. It is clear that if one-fourth of the coal is extracted in working, and the remainder left as columns or pillars of support, the latter will have to sustain a pressure due to the whole area; at the same depth it would be 2666 lbs. per square inch, and so in proportion to the size of the pillars. At the depth of 4000 ft. we shall look for coal much reduced in value by pressure, unless this is modified by the arched form of the earth's crust, and by frictional resistance in the mass in its subsidence.

On the question of working coal by long wall, or by stall and pillar, or bank work, one method should be adopted affording advantages in obtaining the largest percentage of the entire coal, and from what is obtained gaining the maximum proportion of large coal; and, again, the facilities for proper ventilation which the system to be adopted affords. It is stated 90 per cent. of the entire coal is sometimes obtained; as a rule, this is procured by the long-wall system, it gives better results than other methods in this respect, and also in the great proportion of large coal produced over small. The question of dealing with the ventilation of the workings and the goaves is one that can be met in either case, but the mode of working is influenced more by other conditions occurring in any seam of coal; if it is associated with bands or top of loose shale, this will be used to fill up the excavated part behind, together with the material arising from the heaving of the floor. When this filling up material is wanting, it can be only partially carried out; the strata above on falling may give off gas, which has been before the source of accidents. Our endeavour should be to adopt a system combining the advantages of safety, economy of working, and produce of large coal in the greatest proportion from the entire mine. The working of the Middleton seam with bord-gates and banks, referred to, produced only 73 per cent. of the entire coal, of which 23 per cent. was large coal and 50 per cent. slack; this seam is only 30 in. thickness. Seams of this thickness are generally adapted for long wall work: either the custom of the district is against it, or some peculiarity exists to prevent the introduction of another way of working which would seem to offer great advantages. The unsatisfactory results obtained by the present method lead us to suppose that the long wall system might be adopted with advantage.

May 3. M. E.

PREVENTION OF COLLIERY ACCIDENTS—No. III.

SIR,—My last letter on this subject appeared in the Supplement to the *Mining Journal* of March 12. I have up to the present time given you the various means for raising minerals from the bottom of pits to the surface, including the best adaptations for that purpose; also the best breaks in use at collieries; the best and most useful boilers, with a description of the various safety apparatus to be attached thereto, and concluded my last letter with a proof that the consumption of smoke was a great saving, and an easy matter to be accomplished. I will now refer to the various winding apparatus, and ropes or chains, in use, with remarks as to which are the best.

The winding apparatus must, of course, be made to suit the chains or ropes used. The first in use was the round wood barrel of a windlass, on which was wound the plain round hemp rope, which was superseded by the single-link iron round chain; these were also used for the barrel or drum of the gin. When steam-engines were introduced for winding, they applied with them niche rings; these are iron rings, made in two halves, and constructed so as to bolt on to a square shaft; to the sides of these were fastened wood or iron horns, in such a way that the chain or rope could wrap between them. Niche rings were also made of a large diameter, in four parts, comprising a set; these were fastened on a shaft with wood curbs close round the shaft on which the chain or rope wound between the two rings, made up of the four parts. Both the foregoing modes are in common use in South Staffordshire; but the latter is much preferred, as it is possible (although it seldom occurs), with the first-class, for the rope or chain—when it is nearly all wound on, and a jirk takes place—to be thrown out of its place between the horns, and caught in such a way as to break it through. On these niche rings were used, first a wood-blocked chain, made up of three long links, in which were placed a wood block; these were linked together at the ends by three small links, and made up into a flat chain. This was superseded by a flat rivet chain, composed of flat pieces of iron, about 4 in. long, put three or four side by side, and riveted together by means of a round rivet going through them and those of the next row. A flat hemp rope is also used, but it requires lubrication with tar or some other matter to prevent it from getting dry and rotten.

The great improvement on all these is the flat wire-rope, which has many advantages—for it is of much less bulk, and proportion-

ately safer and stronger, very much lighter, works with much less friction, and therefore takes less engine power.

It is not a disputed point as to whether wire-ropes are better for colliery purposes than chains or hemp ropes; but it is a matter of opinion as to whether flat or round wire-ropes are the best. I will give the various reasons adduced in favour of each. Of course, with the round wire-rope niche rings are of little use, as the drum must be used. The great arguments in favour of the flat rope are, that it requires a winding apparatus of less cost than a round one, and that it takes a little less power to work it; for as it winds one lap over the other, and when the greatest power of the engine is needed to lift the loaded tub or skip from the bottom, the rope being unwound, makes a less diameter to wind upon, and thus distributes the power; this is gradually counteracted as the cage ascends and the diameter increases, but the other cage descending equalises it. The round wire-ropes, of which I am decidedly in favour, work with still less friction than the flat, are lighter, and, the greatest consideration of all, wear much longer. The rope being round, it presents a much less surface to the pulleys for wearing, and does not, as is the case with flat ropes, wind on itself, but on to a soft wood drum, so that whereas the flat rope is continually cutting and wearing itself out, the round is wrapped side by side on a wood surface, which can consequently wear it but very little. The above remarks have been upon iron wire ropes; they are also made of steel, and could they be relied upon would be preferable, as the required strength can be obtained with a much lighter rope, and they wear much longer; but steel is so treacherous, you may get twenty or more ropes to wear excellently, and then have one snap almost as soon as you start to use it; and I should fancy it would be a difficult mátter to obviate this. For round wire-ropes two classes of drums are used—the first a parallel one, and the second of a conical shape. These drums are made up of cast-iron rings, with flanges, on which the laggins of timber are fastened by means of wrought-iron bolts. Drums are made from 4 up to 20 ft. in diameter, according to the size of the engines. The conical shaped drums are made to accomplish the same object as is attained by using flat ropes—that is, giving a small diameter to the rope attached to the loaded cage and a large diameter to the rope attached to the empty cage, and thus easing the engine when it has to perform its greatest task; but I should always advise in putting down winding-engines to have plenty of power, and have them well above their work, as it will be found far more economical in the end. Where a large drum is used with coupled engines no fly-wheel is needed, as it answers the same purpose; and the break wheel, which is either placed in the centre or at the end, and sometimes cast on the drum rings, acts in the same way.

I have often, in walking through collieries, seen drums working a little out of truth. Now, it can hardly be imagined the amount of damage this does to a rope, for it is always wearing it unequally, and subjecting it to a series of small jerks; it also gives the engine more work, and is a greater strain on the whole machinery. I have known at one pit four ropes put on in a year, and the cause of their wearing out so quickly has been a puzzle to those in charge, until they discovered it was from the above cause. I would suggest that when drums are erected, and at stated periods if necessary, they should be turned in their places; an apparatus for this purpose could be easily and cheaply made. The next portion of our subject brings us to pit frames. The old three-legged frame, surmounted by a small cast-iron pulley, once so common in South Staffordshire, has now almost entirely disappeared, and in its place is found, at places where they use chains and wind slow, a good substantial oak or deal frame, having four legs, stayed at the top with cast-iron crossings, and having a 6 or 8-ft. cast pulley. Cast-iron frames have been used, but are now abolished, on account of the brittleness of the material, and its uncertainty.

The model pit frame, as I may almost call it, now put up at new pits where they intend winding quickly, is a most graceful and handsome structure, when compared with those which have been formerly used. I will give a full description of it. A foundation of brickwork is first made, on which are laid two strong timber sills; to these are fastened, by means of nuts and bolts, cast-iron shoes, which act as receivers for the upright portions of the frame. The uprights are four in number, arranged in a square over the pit shaft. Looking at them endways they gradually decrease in width towards the top; they are stayed together with cross-pieces, some having cast-iron crosses at the top; the back pair, or those nearest the winding engine, have two sloped back legs coming against them at the top, and finishing in cast-iron shoes on the sills. These last-namèd sloping legs have stays between them and the back legs. A horizontal frame surmounts the whole of these legs, on which are placed the cast-iron carriages and brasses, in which the pulley-shaft, or gudgeon, runs; these are also immediately over the back legs of the frame. The horizontal frame goes completely round the pulley, and is supported at the back by means of pieces of wood resting on the slanting legs. A light wrought-iron hand-rail surmounts the frame, so that a man may walk round the pulley to oil and to examine it, and the rope also. A pair of wrought-iron ladders go up the back legs of the frame. The pulleys used on these are made with a cast-iron boss and rim, but with a large quantity of wrought-iron spokes, so that they are both light and durable, and are from 10 to 20 ft. in diameter. The frames range from 26 to 36 ft. in height, so they give plenty of room between the pit's mouth and the pulley to stop the cage, and prevent overwinding. The pit frame I have described I consider to be the best and most substantial in use. There are others constructed in a variety of forms, but it would be taking up too much space to describe them. I will leave my remarks on conductors, cages, &c., for a future letter.

Dudley, May 2. — COLLIERY ENGINEER.

THE METALS, AND THEIR ORES—No. I.

SIR,—On my visits to different mining localities, and particularly in the more isolated districts, I have often been struck with the absence of general information on the part of some of my otherwise practically intelligent mining brethren with regard to metals or metallic ores other than those upon which they were immediately engaged in raising or producing. I am aware that an extensive metallurgical or mineralogical knowledge is far from being essentially necessary to constitute a good miner, but my impression is that a more general knowledge of the properties and characteristics of ores, metals, and minerals, with their distinguishing tests, could not fail to be of service to those interested in the working of mines. How often does it happen that in describing a vein quartz is said to exist when lime is the mineral present, or that rare and valuable metalliferous ores are cast aside as worthless from sheer ignorance; when but a trifling amount of technical knowledge of their properties would have led to an accurate description in the one case, and to the true intrinsic value being ascertained in the other. Believing even that a little information on this subject will be better than a total want of it, and well knowing that there are many who have but few opportunities of acquiring such instruction for themselves, I have thought the *Mining Journal* would be a convenient and natural channel for communicating a fair amount of information in a condensed, yet comprehensive and useful, manner; and, with this end in view, it will be my endeavour periodically, in the form of a few short articles, to treat of the most prominent of the metals and their ores, in glancing at their uses and properties, physical appearances, the different disguises or combinations they assume, the localities where found, and their characteristic chemical reactions or tests.

By way of introduction, it may be mentioned that out of 62 or 63 elements or simple substances of which the world is built up, 51 are metals; 50 of these are solid at ordinary temperatures, one only—mercury, or quicksilver—is liquid. The ancients were only acquainted with about seven metals, named after the sun and the planets. These were gold, silver, mercury, copper, iron, tin, and lead. Zinc was only known anciently as an ore, and was used to convert copper into brass.—[The metal itself was first eliminated by the arch-alchemist Paracelsus, who was also possessed of the "elixir of life," which proved to be strong alcohol, of which he drank too freely, and brought about his death.]—A few others of the metals were discovered by the alchemists in their misguided search after the "philosopher's stone" and "elixir vitæ;" and the remainder, including many that are as yet mere curiosities in the laboratory of the chemist, have been discovered by modern investigators, amongst whom may be enumerated Wood, Wollaston, Tennant, Davy, Berzelius, Wöhler, Rose, &c.

The metals may be divided into two principal groups, the first division containing those which combine with oxygen at ordinary temperatures forming oxides, and are not used in the arts in their metallic state, but in the form of salts, of which potassium, sodium, barium, silicium, &c., may be taken as types. The second division contains all the metals that are not oxidised, or but slightly so, at ordinary temperatures, and many of which can, therefore, be employed in their metallic state. These may be represented by gold, silver, iron, lead, platinum, &c.—*Shrewsbury, May* 4. EDWARD GLEDHILL.

N. ENNOR ON THE FORMATION OF MOUNTAINS AND MINERALS.

SIR,—In concluding my last letter, which appeared in the Supplement to last week's Journal, I said the growth of metals was a rather perplexing subject, and that most practical men knew copper was continually going off in solution from old deposits of copper, also iron, sulphur, arsenic, &c. The deposit of Devon Consols was a decaying one when it commenced working. I said when I first saw it that it was eating out with arsenical mundic, whilst Clifford was in the very act of depositing the ore when being worked.

What becomes of the ore that is carried off from decomposition? That is, supposing the mine was not being worked. Does it in passing through lodes catch at something from affinity, and settle down in lodes, and form new bodies of ore? Or does it return to Mother Earth, as all earthy substances appear to do? If the latter, do the rocks about lodes, which are known to contain nearly every substance, lend their aid, and send up through the lodes these substances to form ores in them? Lodes may be termed the earth's metallic tree, that carries up all the different substances required to form the deposits of different kinds of ore. All practical miners know that each kind of ore is formed in its own district and rock, and they see a something in the rock and lodes that they think is congenial to its growth. I think this is borne out by nearly every practical man's report. What are his words when he sees the ore disappear? Does he not say that an uncongenial layer or floor of rock has come in, and destroyed the ore, but when it has been sunk through the ore will come in again? I could name whole districts where productive lodes are all unbottomed. The Old Red Sandstone unbottoms every deposit of lead formed in mountain lime rock. I can also name a place where yellow layer of silicious slate crossed a lode between two layers of blue slate: in the yellow silicious rock the lode was nearly all lead, in the blue slate layer no lead of value was found. This goes far to prove that the source of nutrition to supply the growth of ore in lodes is not dependent on a deep internal supply, but on the congenial strata opposite the ore. This accounts for so many valuable deposits being found at a shallow depth. I detest deep mines; as paying ones they are few and far between, and are only so found where a change of strata, or cross lodes and elvans, predominate. These intersections bring water to such points with the contents of many strata in it, and particularly oxygen, for below where oxygen goes ore must die out. I could mention many good lodes shallow where the ore has all died out as they deepened, for want of a something more open to carry down oxygen.

I believe that everything in and on the earth is working under one and the same divine, simplified law, and the strata are only to the lode what the alluvial soil is to the tree. The strata send to the lodes the required portions of (say) A, B, C, which pass along lodes, until they meet something they have a great affinity for, when they settle down, crystallise, and form copper or other ores, nearly opposite to the congenial layers that supplied them. In another place the layer supplied B F; this formed lead ore, then B G formed zinc. B K formed antimony, in granite or slate. O T formed tin. I believe all ores are formed in this way: then, the grand secret is, how do trees bear different fruits? The apple, sweet on one tree and sour on the next; yet all grown from the same soil. But it is plain that a soil that will cause one tree to be a prolific bearer is uncongenial to another; and this is precisely the case with mineral formations. Tin being an oxide, I show O for the oxide, T for the tin. Many persons may be inclined to ask what formed the tin portion? I say amalgamation of substances that united and were refined in passing through the lode. Notice, that to form again the same *ore* the same parts must be present.

Men know that trees grow fruit, and that it comes from the earth to be, I may say, manufactured and refined in its process up the tree; then, the question arises, how does it get there; has the tree the power to draw it from the earth, or does the earth send it to the tree? If the latter, it may be only the earth's own law to propagate its own substances. Every sane man knows well that all things strive hard to propagate; and the lodes to the strata are as the trees to the soil. Most men have noticed the oak tree growing, and may have seen the leaves covered with round marble-like balls. I have seen in Spain thousands on a tree. These are caused by a long-legged fly. The oak is grown, and the fly takes possession of this particutree for its propagation; the tree appears to lend a helping hand, as it sends on an extra quantity of liquid to grow the thousand balls around it. But many may say there are no living insects in the earth to do this. In answer, I may venture to tell them that there are, to all appearance, a number of living substances in the earth, that endeavour to propagate, and do propagate, and grow their fruits for reproduction: one thing is grown to propagate the other, but all have life. This, however, is an open question, but I may mention, whilst on this subject, that the earth requires to be animated, and I say is animated; it has its currents of electricity constantly passing through its lodes, most likely from some central source. This is the earth's life, or moving power. If electricity were taken from the earth what would exist? Would lodes continue to bear metals as their fruit, or would trees even bear their fruit without it? I maintain that electricity is the animation of all life, and its effects are beyond the power of man to comprehend.

Man already knows that he can, by bringing a few metallic substances in contact, send messages to the most distant parts, or produce fire to blow up a powder magazine; then why should he mistrust Nature in bringing substances together, and passing them by electricity through lodes to produce (say) tin?

Before concluding, I may say I have laboured hard to aid mining for 66 years, and surveyed more mines than any other man living. I have constantly watched Nature in her working laws, and discovered some of her freaks, which are grand and numerous, but when discovered they appear as if Nature did her work by slight of hand, amidst grandeur and sublimity. I have through life advocated legitimate mining, and I never buy or sell shares but to aid those who enter mining as a legitimate investment. I have, I may say, in this letter torn a leaf out of my hard-earned book—I hope for their good. My advice to those who wish to invest in mining is cautiously to keep in view that there are two classes of mining speculators. One go in, like men of old, for legitimate speculation; this class require honest reports. The second class are a set of harpeys, who live by selling, and they keep men about them who will sign any report put before them, if paid well. I know mine reporters who never through the whole of their lives sent out a discouraging report, unless they were employed to do so, as tools of "Bears." If the genuine mine speculators were wide awake they in one year could select every such man in the market. I know a flash report on first reading it, and I know nearly every man who lives by writing such.

Any man who has studied mining must have discovered ere this that 90 mines out of 100 do not pay back 1s.: if there be 1 prize in 10 that would do, but what belief can be put in the reports of the men who inspected these 90 mines, and write not with caution, but go so far as to say positively that if the shareholders subscribe more money it will be sure to be a dividend-paying mine, when the mine never showed the trace of a chance of paying cost. Half the men who now go mine surveying never spent two days of their lives in studying rocks or stratification: they tell you the strata are mineralised, but never say with what—in fact, they do not know. It surprises me to see men who pretend to advocate legitimate mining, send men even abroad to select promising mining ground who do not know what strata will bear mineral. No one can believe in a report coming from such persons; I say again, many of whom do not know what layer of rock will bear metal. A broker in London, a few weeks ago, told me that he would as soon send a tinker to survey a mine as a mine agent, as the reports were nearly all the same. The best man was he who could write the report so as to get the money subscribed the quickest. It mattered not two straws as to the prospects of the mine; they had only to select it near a good mine. I have surveyed many pieces of ground in what were termed good districts, with not a known lode in them, and have left such places without giving a report, and received no payment. I have scores of reports now unpaid for, because I gave them conscientiously.

I think Englishmen will never again see legitimate mining unless the freeholders petition Parliament to appoint two general inspectors, one for Cornwall and the other for Devon, who should be called in to vouch for reports published by these men before 1s. was subscribed. It is well known to the lords, and to the majority of the public, that not one-third of the money collected by mine proprietors is spent on the mine. It ruins tens of thousands of families, and costs the public thousands yearly in legislation, without striking at the root of the evil. Mr. Gladstone would bestow a great boon on the country if he were to pass a Bill for mines to be reported on by paid inspectors, not omitting limited liability companies' mines. These inspectors should be practical men, who had passed a severe examination.

Mr. Warington Smyth has done good service in enlightening men on the carrying on of mining, but his subject is pretty well exhausted. I think he should now turn his attention to the subject I have here and in former letters touched on. He is able and has time to do so, and one of the things he should not forget is that of the removal of mine inspectors from the present class, and substitute for them men who have passed examinations by himself, or other able men. He knows how valuable a good, independent Government surveyor would be to criticise all mine reports before any public money was called up. It might be said that these men had not seen the old mines; they need not have done so, as they could show what the past results had been, which would be quite enough to put the public on guard. I see a flash report is now out on a mine in Calstock. Such reports only injure the freeholder and rob the public. When I am again in London I intend to call on Mr. Smyth respecting these subjects.

St. Teath, Cornwall, May 2. — N. ENNOR.

NOVA SCOTIA GOLD FIELDS—OFFICIAL RETURNS.

Statement showing the quantity of Quartz crushed and Gold obtained from the several districts in Nova Scotia during the months of February and March, 1870:—

District.	Mine.	February. Tons.	February. Ozs.	March. Tons.	March. Ozs.	Total. Tons.	Total. Ozs.
Montague	Leckies	—	—	23	38	23	38
	Lawson	20	55	16	50	36	105
Musquodoboit	Hyde's	73	52	—	—	73	52
	Leopold	—	—	—	—	—	—
Oldham	Sterling Co.	22	30	33	34	55	64
	Several	177	75	143	84	320	159
Renfrew	Several	223	71	Returns not in		223	71
Stonnart	Allen	3	3	7	5	10	8
	Mason	—	—	2	10	2	10
	Gisborne	—	—	50	41*	50	41
	Stonnart Co.	5	1	18	2	23	3
Sherbrooke	Palmerston	24	26	108	38	132	64
	Wellington	346	225	196	179	542	404
	Dominion	252	80	277	145	529	225
	Sherbrooke G. M. Co	46	41	127	122	173	163
	West	20	17	23	46	43	63
	Chicago	108	48	50	28	158	76
	Other small mines	—	—	62	41	62	41
Tangier	Strawberry Hill Co.	66	141	50	116	116	257
	Humber G. M. Co.	—	—	51	59	51	59
	Burlington G.M.Co.	28	14	No returns in.		28	14
	Other mines	10	5	—	—	10	5
Unlacke	Unlacke	100	46	166	40	266	86
	Queen's	5	2	—	—	5	2
Wine Harbour	El Dorado	100	28	105	21	205	49
	Small mines	120	9	—	—	120	9
Waverley	Bürkner	218	83	59	31	277	114
	Nor. Amer. G. M. Co	50	33	—	—	50	33
	American Hill Co.	91	45	128	58	219	103
	Lake Major and Rockland	23	3	—	—	23	3
		2130	1133	1694	1188	3824	2321

* This result is from the balance of the pile of 55 tons, from which the first 5 tons of quartz crushed, which yielded 34 ozs., was selected.

The past winter having been a very open one, on a number of the mines that were not supplied with pumping machinery work had to be suspended, and on a large number work was greatly retarded, making the returns for this quarter smalle than usual.

Halifax, Nova Scotia. — JOHN KELLY, Deputy Commissioner.

NOVA SCOTIA GOLD FIELDS.

SIR,—The promised general review has taken longer to complete than was expected, but it shall follow by next mail, meanwhile the returns for March commend themselves to the notice of the Journal's readers interested in our progress:—

District.	Mine or Co.	Quartz crushed. Tons	cts.*	Gold product. Ozs.	dts.	gr.
Wine Harbour	El Dorado	175	0	34	15	17
Waverley	American Hill	168	0	60	18	0
Montague	R. G. Leckie	23	10	38	8	9
	Temple	1	10	0	11	0
	Lawson Brothers	16	0	49	12	0
Unlacke	Unlacke	166	0	40	0	0
Mooseland	Humber	51	13	58	18	16
Tangier	Strawberry Hill	66	0	141	9	0
Oldham	Sundry	108	0	63	3	6
	ditto	68	14	45	8	11
Isaac's Harbour	Mulgrave	59	0	56	14	11
	Sundry	18	0	2	3	0
Sherbrooke	Dominion	277	0	144	15	0
	Wellington	196	18	155	0	0
	Palmerston	107	16	38	12	0
	N. Y. and Sherbrooke	156	10	177	8	0
	Chicago	50	0	27	15	13
	Sundry	56	2	32	6	17

* Colonial weight.

Figures make their own comment, and the above results, especially from the older districts—Tangier, Oldham, and Sherbrooke—are comparatively as good as the average results from the more popular but more distant South American and other foreign gold mines.

Speculation is wholly dead, and it is well understood that no investment on United States or Canadian behalf will be made this year, and it is wholly to Europe—of course England first—that looks are directed for the necessary funds to work really good properties on a commensurate scale. Insufficient working capital has caused the collapse of as many mines as has unskilled or wasteful management.

About two years ago a so-called Government Mining Agency for this province was established in London, but recently-published facts prove that the office was chiefly created to further private schemes of the ex-agent of the Land and Amalgamation Company, who happens to be the leader of the Cabinet. It is natural that a minister, with only 400*l*. a year, should seek to increase his income, but the local press is deservedly loud in its denunciations of this last dodge of one whose disloyal teachings have done as much injury to the country's political reputation as his unfortunate connection with the above-named company has done, and still does abroad, to the reputation of its gold mines.—*Halifax, N.S., April* 21. ACADIENSIS.

MINING IN SWEDEN.

SIR,—Some time ago I was favoured, in company with the Government Inspector of Mines, in having the opportunity of spending a day or two in examining the celebrated Fahlun Copper Mines, a few particulars of which may be interesting to a portion of your readers.

These old mines are situated in "Stora Kopperberg's Läu," meaning great copper mountain county, and from the records it appears that they have been in operation for some centuries. During the summer, particularly in these high latitudes, it is a most pleasant trip from Stockholm to Gefle by the steamer: on arriving at the latter place, on the wharfs on each side of the Channel are immense quantities of deals and all sorts of timber ready for exporting to different parts of the world; from here one takes the railway to Fahlun, which traverses a very picturesque country of woods and lakes. When we arrive at Fahlun, having travelled about 50 miles, on emerging from the railway station one is at once reminded of being in a mining district, from the sulphurous fumes arising from calcining the copper pyrites, yielding from 4 to 5 per cent. of copper. The gangue of the lode or deposit consists of quartz, copper ore, iron, and magnetic pyrites hornblende, and I noticed small crystals of tourmaline. We first examined the surface. The machinery consists chiefly of waterwheels for pumping and drawing purposes. The guide asked me if I would like to see a scientific piece of work, and on proceeding to the spot I found it was the pumping-machinery he referred to: your readers may fancy my surprise on seeing an 8-inch wooden-pump,

strongly bound with bands of iron, and also a wood-rod instead of a neat iron bucket-rod; instead of a float in the cistern a small water-wheel was fixed under the collar or discharge launder, and a line connected to a bell in the wheel-house, the continual ringing of the bell indicating that the pump was discharging its quantum of water.

It is surprising when one remembers that these mines are fully 200 fms. below the surface yet that every part of the pumps, rods, and buckets are made of wood, and this in a country abounding in any quantities of the richest iron ore—in fact, a deal of it will produce nearly double the percentage to what some of our English and Scotch iron ores do, although the country abounds in forests from which charcoal can be made, but means of transportation are the great drawback, and to enable Sweden to utilise her mineral wealth railways and capital are required.

I may remark that economy in working the mines is carried out to a great extent: the miners still use the needle in charging the holes, but this I call very questionable economy, as we all know the value of good fuse, and the dispatch and safety that attend its use. In a conversation I had with the engineer in charge on the use of Dynamite, he remarked that it had been tried in every way at the mines, but he had come to the conclusion that powder was by far the most economical; the latter costs here about 43s. per 112 lbs. I consider Dynamite can be used to advantage when the stope or face of the rock is wide—say, from 10 to 20 ft.—such as can be seen at the Fahlun Mines, where underhand stopes are much in vogue, and as the rock is very compact it can be carried out with safety and economy.

Ourselves and guide now being prepared to descend the mines each were provided with a lighted pine torch instead of a lamp or candle, and, preceded by our guide, we descended a part of the way by steps and thence by ladders to the bottom of the mines. The small quantity of water is quite surprising considering the depth of the mines, but the surrounding strata are very compact, and free from faults and disruptions. I examined some of the levels in course of driving; the miners display great judgment in carrying good, wide, and open levels, which admits of the ground being explored cheaper, to say nothing of the improvement in the ventilation. Miners' labour is cheap in this country, and I have seen levels driven here for 4*l.* and 5*l.* per fathom that in England would cost 10*l.* or 12*l.* per fathom. Common labourers earn about 1s. 4d. per day, and work twelve or thirteen hours; carpenters and blacksmiths earn 1s. 8d. per day. I may say that every requirement for carrying on mining and iron works is remarkably cheap, and no country, in my opinion, offers such advantages for investment of capital. I often think the Swedes are backward in speculating and developing the resources of their country, but the fact is there is a lack of capital, and railways are at present much needed. The large quantities of rails and machinery that are being sent from England to Russia is attracting the attention of the Swedish ironmasters, and it is very likely that a new line of railway will soon be commenced, to intersect most of the large iron works.

I purpose in a short time visiting some of the largest of the iron mines, and will, by your permission, give your readers a few particulars through your valuable Journal. W. Hoskin.

Sulphur Mines, Norrtelje, Sweden, April 27.

COMPOUND ENGINE v. CORNISH ENGINE.

Sir,—In Mr. Mordue's paper on the Compound Engine, in the Supplement to last week's Journal, the Cornish pumping-engine is spoken of as having a slow piston speed; this is a mistake. A three-valved Cornish pumping-engine, where the engine lifts the ram, and the ram forces the water, has the highest friction of any known steam-engine, and it does the highest amount of duty of any known form of steam-engine. And this is easy to understand, because the engine has at each stroke to lift a compact mass of dead weight at any speed, and consequently it lifts it at a variable speed, at a great velocity during the time steam is admitted into the cylinder, and slowly as it reaches the end of the stroke. The space of time between each stroke of a Cornish engine depends upon the "cataract," by which the pause can be made long or short. So that when it is said that a Cornish engine goes slow it means that the cataract is so arranged that few strokes per minute may be made, but each stroke is made at the same velocity, whether one stroke or five strokes per minute be made. The piston, during the period that steam is admitted to the cylinder, travels from 1200 to 1500 ft. per minute. A Coalmaster.

P.S.—I have often thought it would still further increase the duty of the Cornish engine if by some means the cylinder bottom and the under side of the piston were jacketted, and a current of hot steam always playing in them.

THE COPPER TRADE.

Sir,—There is one statement in the notice in last week's Journal concerning the proposed reduction of produce which requires correction. I do not think "it would largely increase the profits of foreign mines," &c., for it is clear to me that the proposed reduction of produce must be attended with temporary inconvenience and reduction, or, perhaps, suspension of profits. Both of these must be felt in a greater or less degree, according to circumstances, but what I look at is the end, as a natural result, in the bringing into harmony the relations of supply and demand.

I foresee the difficulties there must be in the way of bringing about the changes referred to, inasmuch as the principle must be first generally recognised, and then the various circumstances of the parties which it is proposed are to enter into this combination. The foreign mines, it is stated, are at present producing copper, as compared with the British, in the proportion of eight to one, and it is quite natural, therefore, that the managers of the former should be looked to to take the initiative in this matter. I admit my total inadequacy to express any opinion as to how parties so numerous, and scattered as they are all over the world, are to be brought together, but we say "Where there is a will there is a way," and much more numerous bodies, and bodies with diversified and opposing interests, have been frequently brought together for the attainment of a common good. The man who would undertake and carry out this object would be entitled to, and I doubt not receive, ample remuneration for his service, and a life-long grateful remembrance from a large class of people who have nothing better to give.

One of the "One and All."

GOLD MINING IN CALIFORNIA.

THE TUOLUMNE—THE OLD CORNISH STAMPS.

Sir,—I perused with no small amount of satisfaction the proceedings of the first general meeting of this company, as reported in last week's Journal. I am in no way interested in the undertaking myself, and, therefore, what I have to say has no other object than to do what I can to promote the development of gold mines in California by the employment of English capital.

The properties acquired by the Tuolumne Company have proved themselves, by previous operations, to merit a miner-like and systematic development. As to the Martin Mine, the average yield of its ore favourably compares with the richest mines in the State, while the cost of working will be so small, that if the operations be carried out upon only a very limited scale, this mine alone should yield a large return upon the entire capital of the company. As to the Grizzly Mine, that is a property which can be developed to any extent, limited only by the amount of capital that is brought to bear upon it. Its quartz does not yield such a high percentage as that from the Martin Mine, but the lode being of great width, masterly in character, and yielding a good average percentage, operations can be extended to any scale; and as at all seasons of the year there is a supply of water, the returns from this mine, under the most unfavourable circumstances, should be equal to a large interest upon the capital.

The directors, however, cannot be too careful in the selection of the manager. He should not only be a man of repute, but also a man who has had some experience in gold mining in California. With such a one at the seat of operations, I look forward with confidence to a brilliant career for the Tuolumne Company.

A word about the all Cornish stamps. I can bear testimony to the statement of Mr. Sharwood, "That many really good mines in California have been ruined by the introduction of patented inventions for crushing the quartz, and *that the simple Cornish stamps is the most effective.*" If it were needed, I could name a long list of "really good mines" thus brought to positive grief. I can also bear testimony to another statement made by Mr. Sharwood—"That if Californian mines were worked with judgment and care, and in a systematic manner, they would not only pay much larger dividends than they do at present, but continue to do so for many years; *and that there is less risk in developing Californian gold mines than ordinary metalliferous mines in this country.*"

I need not now trouble you with statistical facts corroborative of this statement; suffice it to say, that wherever well-selected Californian gold mines have been treated with ordinary mining skill, and with a sufficiency of capital, failure is most certainly the rare exception.

If only ordinary care and judgment are employed in continuing the development of the two "really good mines" possessed by the Tuolumne Company, such results should be quickly realised as to amply satisfy all associated with it.

May 3. A Californian Miner.

NEW CENTRAL SNAILBEACH, AND GREAT LAXEY MINES.

Sir,—On looking over the plans and sections I have been much struck with the similarity in position, antecedents, and prospects of two distinct groups of lead mines—namely, Great Laxey, and that part of it called Dumbell's, in the Isle of Man, and Snailbeach and the adjoining mine of New Central Snailbeach, in West Shropshire, mines whose names are now as familiar to us as Household Words, but which but a few years back were known only to a small number of mining men. Great Laxey has been at work for very many years, but in the old mine it was under the 100 fm. level that such great and continuous courses of rich ore ground were found, the bottom of the mine giving promise of riches that will hold down as deep as human ingenuity can follow them. Dumbell's, on the same lode, drained by the workings in the old mine, has already opened out a vast amount of ore ground under the 100, and bids fair to continue down as rich.

Turning to Snailbeach, this mine has also yielded immense quantities of ore, being one of the oldest, if not the oldest, dividend mine in the country, level after level opening out continuous courses of rich ore, many of which, I understand, have been over 100 fms. long, and averaging more than 10 tons to the fathom, and the bottom of the mine continuing as good as ever. On the same lode, and within about the same distance as Dumbell's is of the old mine at Laxey, is New Central Snailbeach. The lode is dry, being drained by the works of the old mine, a very promising feature; and the 100 fm. level, or, as it is called, the 200 yard level, evidently shows the existence of a splendid run of ore ground immediately beneath it, which it is believed, as in the case of Dumbell's, will be found fully equal to that in the old mine. The improvement which has taken place in the 200 yard level is very great indeed, and, although the lode has been so far in the shale, it is so strong in its character that it has carried a continuous run of ore for a depth of 80 yards, so that now this adverse influence is disappearing we may look for a great improvement in riches as the mine deepens. The lode in the 200 yard level, where it has been cross-cut, is found to be 17 ft. wide, orey throughout, but for 3 ft. wide, in some places, is worth as much as 4 tons to the fathom. Great Laxey Mines were, *de facto*, under the management of Capt. John Kitto when they recommenced a dividend career, and New Central Snailbeach is at present under his care. Let us hope he will be equally successful in this case, and that New Central Snailbeach will shortly commence to pay dividends as large as that portion contributed by Dumbell's to the Great Laxey Company. The report of Capt. Walter Eddy, a copy of which I have just seen, leads me to believe this will be the case. A Shareholder.

London, May 5.

THE TERRAS TIN MINE.

Sir,—In my short notice on this mine, which appeared in the Journal of April 23, I stated that, after thoroughly investigating the matter, I was of opinion the property contains in itself all that the prospectus and the reports claim for it; at the same time, I promised to give yonr readers some additional particulars of my observations as to the property, progress, &c.

Captain John Edwards, the resident agent, a practical miner from early boyhood, of large experience, great energy, and close application, having had charge of some of the most extensive tin and copper mines in the county, having also spent a considerable time in South and North America, for the purpose of inspecting and reporting upon mineral properties for and on behalf of large capitalists, walked over the entire sett with me, and carefully pointed out, not only the great elvan course, but the numerous tin lodes running transverse from, and which form junctions with, the great rich tin-bearing elvan course. By my request Capt. Edwards had several fresh shode pits at various points put down upon the great rich tin-bearing elvan, and from a number of these pits I found, by practical tests, that the produce in tin is more than double the quantity per ton than that which is given in the company's prospectus. The elvan course is highly granitic in character, and decidedly the truest and richest tin-bearing elvan I have ever met with: it passes through argillacious or clay-slate, which is soft, and much of it of a micacious rich mineral character, and highly congenial for the production of tin.

The elvan course runs with the rise of the hill, by which immense backs may be obtained, as stated by Mr. George Henwood, M.E.:—"This vast lode will yield any required quantity of tinstuff, the supply can only be limited by the power you may employ to procure it. You may positively work it for 50 years as an open quarry, for such it literally will be. You may bring in a cutting without even an adit to quarry or stope a back or heading of not less than 60 to 70 fms. deep, so that you may raise a supply for 200 heads of stamps for the entire period of your lease without cost of engine (beyond stamping power) coals, candles, or timber. The very fair trial to which the produce already raised for proof shows the whole lode stamped without any selection to yield 1 cwt. of black tin to 100 sacks of work, an average quite equal to many of the most celebrated and remunerative of the western deep and expensively wrought mines." "To obtain success nothing will be required but spirited management and extensive workings, with proper capital. These provided, the Terras Mine will soon be parallel with the best tin mines."

Capts. Edwards, in his report of March last, says—"The sett is very etensive, being about ¾ mile from north to south, and about ½ mile from east to west, and contains eight known east and west lodes, from 3 to 6 ft. wide, some of which have been worked on the backs by the old men, and there can be no question that large quantities of tin have been raised therefrom. On the north part of the sett an adit level has been driven from the valley up to within 30 fms. of some of the lodes, which adit would, if continued, cut the lodes at about 35 fms. from the surface, leaving very valuable tin ground for stoping, all of which lodes cross the elvan course hereinafter alluded to. In sinking for the foundation of the stamp engine-house we discovered a caunter lode about 2½ ft. wide, which is composed of capel and peach, with large stones, containing nearly one-half tin of good quality. We shall commence driving on the course of this lode, and in extending the driving about 15 fms. we shall have about 15 fms. of backs, and at which point it will form a junction with the great elvan course, which passes through the centre of the sett, and which runs nearly north and south. The average yield of black tin per ton of stone from this elvan course is from 10 to 15 lbs., and this elvan course will be worked open like a quarry, and above the water level. I consider this rich elvan course, coupled with the east and west lodes, second to no other mine in the county, and it cannot, in my opinion, fail in giving large profits for the necessary capital to work the mine."

Whilst I fully corroborate Capt. Edwards in his statements, I find in addition, and by his aid, several more, and apparently very large and productive, tin lodes, which also form junctions with the tin-bearing elvan course; and I hardly need to here state, as it is a well-known fact, that at the forming of such junctions rich and large deposits of mineral are found, consequently the value of tin now standing as reserves in the elvan course only, and above water-level, I conceive not to be less, but at the present price of tin considerably above, the estimated value named in the company's circular, which is 1,320,000*l.* The works are situated near the valley, and so as to take full advantage of the rise of the hill, down to water-level, but giving ample room not only for extensive convenient floors, but every facility for discharging and disposing of waste from the floors, and also to carry by trams the tinstuff, as quarried and broken down, direct into the stamping-mills. The new engine-house, engine, boilers, and every requisite with and for working 48 heads of stamps, including floors with best improved buddles, Capt. Edwards has struggled hard to have ready and at work by May 1; however, I am inclined to think he will not get the machinery and stamps at work before the 6th or 9th of May. Having opened the ground, and so as to give an immediate and constant supply of tinstuff for the stamps on and after starting them, a large batch of tin should, and I believe will, be ready and in the market in the month of June next. The immediate erection of additional engines and stamping apparatus, &c., will be proceeded with, so that by October or thereabouts not less than 200 stamp-heads, with all the requisite appliances, will be at work. The contract for performing the same was kindly laid before me. Captain Edwards is strongly of the opinion he can, and it shall be his endeavour to, have the 200 heads in full play before the time named. The whole should, and no doubt will, be accomplished in the time, as no place can be more convenient for erection and work.

In the language of the late Capt. Henry James, of Redruth, who inspected and wrote upon this property, I repeat—"Taking all the advantages into consideration, I do say that a ton of tin should be brought into market for even less than 30*l.*" "I find that reckoning the tin ground to be 30 ft. wide, and it exceeds that, you have 220,000 cubic fathoms, which, judging from the average produce of what has already been broken, and the fair trial made, as well as what I have seen of it myself as now standing, will probably exceed the value of reserves of any tin mine in Cornwall."

Upon and after minute investigation I can do no less than corroborate the reports, and also the prospectus of the company as put forth by them on this property. And by the erection and properly supplying and working the 200 stamp-heads, and which may be much increased (the rich tinstuff being so extensive), immense profits upon the capital cannot fail of being made. Old Man.

Tavistock, May 3.

THE VAN MINING COMPANY.

Sir,—I should like to give a word of advice to the directors of this company, seeing that they have a splendid property which, doubtless, will prove to be one of the prizes in the great lottery of the mining world. At present they have only paid 10s. per share: now, that is very poor interest upon 87*l.* per share, which I know has been paid for shares. There is a report current on the Stock Exchange that the shares, if the lode be cut rich, will rise to 100*l.* I know this, that if you want to buy shares to *hold* at the present time (May 3), you cannot get them at once for *cash*, which proves to me that the shares are well held.

If the directors would declare an interim dividend, like the Cape Copper, the investing public would soon buy Vans, but at present only a few persons hold the shares, and hence the difficulty to get any even at present quotations. The reserves alone would warrant an interim dividend of at least 1*l.* per share.

May 3. A Buyer.

CALLINGTON AS A TIN DISTRICT.

Sir,—Owing to the very low price of copper, attention is being directed to the tin-bearing lodes of this district which are known to exist on both sides of the granite range known as Kit Hill, and most probably these lodes will now be more fully developed than heretofore. At the New Great Consols, on the north side of the hill, preparations are being made for bringing to market the large quantities of tin known to be associated with the masses of mundic in that mine, and which is likely to pay well. Then, close to the New Great Consols, and still nearer Kit Hill, is the Excelsior Mine, which promises to be a good tin mine; while a little to the west is Redmoor Mine, where tin is being returned in paying quantities. On the very summit is Kit Hill Mine, which has produced large quantities of tin at a comparatively shallow depth, and a lode now being worked on the south side, but in the same sett, is producing excellent work only a few fathoms below surface. Still further to the south, adjoining Kit Hill sett, is the Old Wheal Tonkin Tin Mine, now included in the Wheal Mary Florence sett, which latter has been hitherto worked for copper only, but the general opinion is that more attention ought to be paid to that part of the sett where tin is known to exist, especially as a shaft has been sunk by the Old Tonkin party on the course of the lode about 27 fms. below surface, and ground opened both east and west of shaft producing good work for tin, and from which they returned several parcels; while there are two other lodes on the north of the shaft, only seen at surface, and extensively operated on by the ancient tinners, but never intersected by a cross-cut from Tonkin engine-shaft, which could be done at a comparatively small outlay, and the rotary engine where it now stands could be made available for the purpose of stamping the tinstuff, as well as pumping the water. The probability is if this course were adopted and carried out the mine would in a very little time become self-supporting, and at no very distant period pay dividends, and should the price of copper again rule high the company might then work the western part of their extensive sett to a great advantage; but for a quick return it is evident the *tin* lodes should be wrought, and that vigo ously. Observer.

SOUTH WHEAL FRANCES.

Sir,—The report and statement of accounts, submitted to the shareholders at the meeting held on Monday, is before me, and I regret to observe that they should have continued to allow the heavy balance against the mine to be carried over from time to time, instead of making the necessary call to liquidate the debts of the mine, and so relieve their co-adventurers from a heavy responsibility. On reference to the Stannary Act, 1869, I find a clause which most certainly should preclude shareholders at any meeting from authorising the making of any rule or regulation to enable a company to borrow money; and I cannot understand how a banker, after a recent decision of the Vice-Warden, could be a party to breaking such a wholesome law. Had I been present I should have entered my protest against the resolution unanimously passed as being contrary to the provisions of the Act referred to; and I very much question whether the shareholders are bound by such a resolution. If, as I am led to believe, the committee are looking forward to paying their debts out of the costs expected from West Basset, I fear they will have to wait a long time, as I cannot see the smallest prospect of this costly litigation coming to an end. A Shareholder.

London, May 4.

bottom of the engine-shaft, which is 40 fathoms below adit. The stratum which these lodes traverse is the clay state of the district, in which all the large deposits of rich copper ore have been found, is in close proximity to the Hingston Down and Kitt Hill granite range, and, therefore, in a geological view must be considered as highly favourable; a glance at the surrounding mines will also tend to confirm this, having the Prince of Wales and Hingston Down Mines on the north, West Drake Walls, Drake Walls, and Wheal Arthur on the east, and east Cornwall and Silver Valley to the west. These mines have been and continue productive, and looking at the large returns that have been already made from the Queen Mine at such shallow workings, I cannot form any other conclusion but that you have a property that with judicious development will be highly remunerative.—J. GIFFORD.

Greenwich-road, London, S.E., April 25.

T. J. BARNARD, ESQ.,—In compliance with your instructions, I have carefully examined the Queen Silver and Copper Mine, and herewith beg to hand you my report thereon:—This property is situate in the parish of Calstock, Cornwall, is held under the Duchy, and contains a large area of mineral land, its extent on the course of the lodes being some 700 fms., and from north to south upward of 500 fms. The lode to which attention is just now more particularly directed is the silver lode, and is the continuation of the lode which produced such great riches in the old Silver Valley Mine. On this lode are sunk two shafts, about 8 fms. from surface, and distant from each other some 25 fms., communication being made by a level from one to the other. The lode as seen in this level will average about 3 ft. in width, and is composed of flookan, principally containing carbonate of iron, and occasionally stones of rich silver-lead and stones of nearly pure silver. It is from these shallow workings that I am informed about 700*l.* worth of silver has been obtained and sold, and I brought away with me magnificent specimens of silver ore from this lode, so rich, indeed, that there would be no necessity of trying to dress or treat such ore. When small bunches or nests of such a description are met with picking out carefully is sufficient treatment to prepare this for smelting. It is the poorer ores of which the bulk of the lode is composed that should be carefully manipulated, as I have no doubt but that ores containing (say) 10 or 12 ozs. per ton can be made to pay. A very large quantity can here be obtained of this quality—in fact, I was assured by Captain Knott that his assays of the old burrows has always given him from 6 to 8 ozs. per ton, and these burrows are, of course, not nearly all lode stuff, as in places where the lode is small the walls are carried more or less with the level. East o' these workings a shaft has been sunk, and at about 35 fms. a cross-cut north and south has cut the silver lode and a copper lode running nearly parallel to each other, but converging as they go eastward. On the copper lode, which is a very promising one, tributers have been and are still at work, but there is difficulty experienced in getting the ore away, as the level wants clearing up, and winding-gear is required at the shaft; this, of course, will take time, and until then it is not advisable to do any more here. A considerable pile of ore is broken down, and sufficient has been done to show the character of the lode, which is composed of quartz, prian, peach, and arsenical and copper pyrites; when the mine is drained and properly provided with winding and hauling gear this point will then doubtless be further prosecuted. I will now revert to the silver lode, the silver department being that to which I was required to more particularly devote my attention. I broke stones from the silver lode in the 35 which assayed 114 ozs. per ton; the correctness of this result is sufficiently proved by the certificate of assay from Messrs. Johnson and Matthey, the assayers to the Mint, which I enclose. The balance which I had the use of was not sufficiently delicate to enable me to arrive at exact results; consequently, I had my own tests verified by the above-named firm. The following is a copy of Messrs. Johnson and Matthey's assays:—

CERTIFICATE OF ASSAY.

No. 1.—Produce of silver 106 ozs. per ton of 20 cwts.
No. 2.— „ „ 13·250 „ „
No. 3.— „ „ 44 „ „

No. 1—106 ozs. per ton of ore—is, as I have mentioned above, the sample of ore broken by me in the 35 fm. level; this was taken from a string from 3 to 4 in. in width, and now standing at the side of the level for some 5 or 6 fathoms. The stones if picked over could have been made to produce a much higher yield, but I carefully pulverised all the gangue with which the silver was mixed purposely, my object not being to assay a picked specimen. No. 2—13·250 ozs. of fine silver per ton of ore—is from that part of the very extensive Queen sett, recognised by name as the Wheal George. No. 3—44 ozs. of fine silver per ton of ore—is the most interesting sample of all, and for all practical purposes is by far the most useful, and I must say I was surprised at its richness. It was this sample in particular that induced me to have my own estimates verified by assayers where they had sufficiently delicate balances to arrive at absolutely accurate results. This was a sample of refuse from dressing, and was part of a pile lying outside the silver-house, after having been carefully picked over, and every stone of silver seen taken away, this satisfactorily demonstrating the great richness of this parcel of ore in its original state. In the silver-house is about 1 ton of ore, which has been principally picked from this heap, and is consequently much richer, I believe about 150 ozs. per ton. I now come to the treatment of the poor ores, which of course here as elsewhere form the great bulk of the mine's produce, much of this will of course have to be brought to surface, whether intended for treatment or not, consequently the cost of manipulation in this case may be computed as its only real cost, and I believe that it is quite possible to treat silver ores at a profit of lower percentage than has been hitherto done in England. I make this statement not because I believe in a total revolution in the English method of treating silver ore, but because it is at present done in Hungary. On the Grüner lode poor argentiferous ores, containing according to the Government statistics 16·128 grains of gold and 1 oz. 12 dwts. 15·36 grains of silver per ton are made to pay cost; this yield of gold being so small it is not extracted by amalgamation, but is left in the silver with which it is obtained in the smelting process.

The following is an abstract of the process there employed for the treatment of poor argentiferous ores:—The ore being in the first place reduced to a very fine state of subdivision, generally by stamps, is passed through and over classifiers, where a very perfect classification takes place, according to the specific gravity of each particle, and not according to size, as is the case where any system of sieves are used for the purpose of classification, this difference being of considerable importance to the after treatment. It is now taken from each classifier, and allowed to flow over Rittinger's self-acting continuous side-blow percussion tables, which effect a perfect separation of any contained metals from their matrices. The superiority of these tables over other modes of dressing consists in the fact of their being continuous in their working, a clean product being obtained at the first operation. A great saving of labour is also effected on account of their simplicity of action, as after being once set properly to work a boy can attend to several, thereby entirely dispensing with experienced dressers. The foregoing is the treatment I would advise for the concentration of the poorer ores, this would dispense with the necessity of treating the whole bulk, and the concentrated mineral for the poorer ores would be of sufficient richness to treat by amalgamation, if desired. It is intended to erect a 36-inch rotary engine for pumping purposes, when operations on the copper lodes will be resumed with spirit; this engine being also applicable for motive power for the reduction works. In the meantime, while this is progressing, I should advise a small barrel to be put to work treat samples of the ore to now at surface but the concentration of the poor silver ores is the point to which the greatest attention should be devoted, as I am convinced that this is quite possible, and is the source whence permanent returns will be made.—HENRY G. WILLIAMS.

What has the *Investors' and Capitalists' Review* to say to this? And I have equally good reports from Capt. W. Pascoe, G. M. Henty, and other well-known mining agents. This "Review" is, I understand, the property of the world-renowned brokers, Messrs Ross and Co.; and, if only in justice to myself, I feel bound to reply to certain statements and insinuations. Refer to this "Review" of April 1, 1870:—"The last number of the *Mining Journal* baits its pages with a couple of columns of what professes and confesses to be a scheme for obtaining from the public 5000*l.*, for the working of a mineral property that, if the description were in any way guaranteed by facts, ought to be worth something nearer 5,000,000*l.* Royalty itself has been invoked at its baptism. 'The Queen Silver and Copper Mining Company (Limited)' is its modest title."

After commenting upon Mr. Thos. J. Barnard in a sneering manner, as a most Virtuous man, albeit a bad grammarian, the next remark is—"He gives the result of eight separate analyses of ore made by 'Mr. Phipson, of Putney,' one of which gives 160 ozs. of pure silver to the ton, another 100 ozs., another 640 ozs., another 6048 ozs., and another 8275½ ozs.! Here is an inheritance to make the mouth water, and all standing idle for the want of a second-hand pumping engine." Mark the slur upon Dr. Phipson. This gentleman is one of the first analytical chemists of the day, and has written some thirty most valuable works in different languages upon the most scientific subjects.

The Tuolumne Gold Mining Company (Limited) figures upon almost every page of this marvellously literary "Review," and Messrs. Johnson and Matthey, the assayers to the Mint, are brought forward, with a superabundance of zeal, to show that they have accomplished the extraordinary feat of extracting and proving that the Tuolumne Gold Mine yields 3000*l.* worth of gold to the ton of stuff. Marvellous! Almost incredible! But I somehow cannot refrain from expressing surprise that if 3000*l.* worth of gold can be obtained from a ton of stuff, and there is any quantity of it, what earthly reason there can be for forming a company at all. This would surely by any banking firm be designated and classified under the head of "ample collateral security," and advances of bullion to almost any extent made upon the security of gold property that only required to be conveyed to the Mint to be converted into the most valuable coin of the realm, which would enable the lucky proprietors of the mine to hold their own, and thus dispense with the trouble and expense of forming a company, and the services of the public altogether. Are not the promoters rather short sighted? They ask but 8000*l.* in cash for the mine, and yet only 3 tons of the mineral matter of this property represents 9000*l.* Well, this must indeed be a marvel of mining history and, shall I say, laconic riches.

Turn to the Review again:—"In that happy Cornish land of his, where 8275 dollar pieces go to the ton of earth (or just one-fourth the weight), we are left utterly inconsolable by the fact that we have not one particle of evidence to show that these precious specimens ever came from this mine at all."

This is most insulting and slanderous; and, in reply, I refer the public to the foregoing report. I further send you a nugget of pure silver by this post, weighing a few grains short of 1½ oz., which was extracted from a piece of silver ore of exactly 3 ozs. in weight. The assay was made by one of England's best silver assayers, our agent, Capt. W. Knott. It was a remarkably rich specimen, and was anticipated by him to yield about one-third silver; but the result is 50 per cent. This throws the Tuolumne Gold Company quite in the shade, as the money value of ½ ton of silver is about 10,000*l.* However, unfortunately, and it is to be hoped unlike the Tuolumne Mine, we cannot revel in an unlimited quantity of such a quality. The Tuolumne Mine has my best wishes, and so have Messrs. Ross and Co., and all their properties; and may even a certain oyster scheme be propitious to those who extended to it the use of their strong arm and assiduous aid; may it, indeed, astound the natives; and, lastly, may the shareholders indulge in handsome dividends, and not be bitten by this delicate shell fish, since this is a paragon of nature, as some practically experienced individuals have discovered "that although an oyster has no teeth, it has tremendously hard gums."

I would draw particular attention to the statement of Capt. H. G. Williams, that in Hungary "16·128 grs. of gold, and 1 oz. 12 dwts. 15·36 grs. of silver per ton," which means a money value of about 10s., will pay cost. I know nothing of this system, and will simply state that if 10s. will pay cost, there is in the Queen sett, practically, almost an unlimited amount of stuff that will yield 10 ozs. of silver to the ton, which means 50s., and some of the best parts of the lodes will average 100 ozs.; and occasionally stones are found that will give as high as 10,000, and in the case with the specimen I now send you 17,920. Now, I am discussing the matter calmly and dispassionately. If Hungary can make a good profit of mineral stuff worth (say) only 1*l.* per ton, what is to hinder England from following in the wake? My description of the property "is guaranteed by facts," and, according to the *Investors' and Capitalists' Review*, it must be worth five millions. I do not rush into print to delude and cheat the public. I have introduced to the world what I consider, and which are turning out to be, most valuable properties. One has gone wrong, through the unusual quantity of water to contend with, and defective machinery, and I have returned all the money, and borne all the loss and burden and heat of the day myself. The mass of the mining world are down upon me; why, I know not, unless it is that I have shown a spirit of independence, and given blow for blow. But enough of this, I want to help the mining world, and be in friendship with it—be in good repute with the public, distribute to them good dividends for their investments or speculations, and at the same time naturally benefit my own pocket. Here is a property that, without any "Barnardian Rhapsodies," contains mineral wealth that if the statements of Messrs. Johnson, Matthey, and Co., Dr. Phipson, Capt. H. G. Williams, and Capt. Knott be correct, looks as though destined to turn the ebb tide of England's mineral wealth to a strong flood, and I knew perfectly well what I was writing when I wound up my prospectus with—"What a blessing, what an achievement for the Queen to attain, to be the mainspring of opening up rivers of wealth, adding fresh laurels to England's world-renowned fame for thousands of years, as the first and great mining seat of the world, calling back with a hearty welcome her sons of toil from foreign climes, who, through the temporary depression of English mining, have been forced, from actual want of daily work and bread, to leave its well-loved shores." Show me any foreign silver mine that is as rich in quality, or quantity even, as the Queen. Mining men—nay, it is scientific men I want—come forward and lend me a hand in proving England's valuable mining properties. If even 10 ozs. of silver to the ton will only pay a good profit, I can lead you north, east, west, and south to almost unboundless wealth; but what I want is scientific help in the extraction of the silver. This property is worth more than a million sterling this very day, if the remarks made by Capt. H. G. Williams can be verified, and I have no reason to doubt them; a little time will prove. The shares have now gone from their original price of 1*l.* to 1*l.* 10s. each, and, reviewing everything, I think that any sensible person must state that it is the cheapest and least speculative mine ever brought before the public, and that there is a fair and every possible prospect of them going up to 20*l.* in a short space of time.—*Tamar House, near Tavistock, May 4.* THOS. J. BARNARD.

[For remainder of Original Correspondence, see this day's Journal.]

ECONOMY OF FUEL IN BLAST-FURNACES.

In the *Mining Journal* of Feb. 5 we published a description of the improved Regenerative Hot-Blast Stoves at the Ormesby Iron Works, Middlesborough, read in a paper before the Institution of Mechanical Engineers at Birmingham. The adjourned discussion on the invention was resumed by the members on April 27.

Messrs. COWPER and SIEMENS' improved regenerative hot-blast stoves, as described by Mr. COCHRANE, are heated entirely by the waste gas taken off from the blast-furnaces; and the heat developed by the combustion of the gas is stored up in the stoves by means of the regenerator, consisting of a large mass of open-built fire-brick, through which the heated current is made to pass in a downward direction on its way to the chimney. The mass of fire-brick thus becomes heated up to a very high temperature at the top, the temperature gradually diminishing towards the bottom of the regenerator; and the blast being then caused to pass through the regenerator in the contrary direction takes up the heat stored in the fire-brick, and becomes itself heated to the same high temperature previous to entering the blast-furnace. In the present stoves, which are of considerably larger dimensions than the original stoves on the regenerative plan at these works, the combustion chamber at the top of the stove has been increased in proportionate capacity, in order to ensure, as far as possible, the complete combustion of the gas in the stove before entering the regenerator. The area of all the passages has also been enlarged, and the fire-bricks in the regenerators are set wider apart. A recent improvement has been made in the construction of the regenerators, which avoids the necessity previously existing for the use of a purifier to separate the dust brought over with the gas from the blast-furnace, for the purpose of preventing the passages in the regenerator from becoming gradually choked up by the accumulation of this dust. In the improved construction the successive courses of the fire-bricks are so arranged that the edges of the bricks in each alternate course project a short distance beyond the edges of those in the courses immediately above and below; and the regenerator is thus made up of a collection of vertical flues, the internal surfaces of which are broken by a number of projecting ledges, whereby the interchange of heat between the mass of brickwork and the currents passing through it is very completely effected. At the same time, a clear straight passage is left from top to bottom of each flue, large enough to admit of cleaning out the dust deposited upon the faces of the brickwork, either by the insertion of a brush or by the use of a jet of blast, without the necessity of removing any of the bricks for the purpose.

In consequence of these improvements in the regenerative stoves, the blast heated by them is now maintained in regular working, at the high temperature of more than 1400° Fahr.; and although the annual expenses for cost and maintenance of the regenerative stoves are about the same as those of the most improved cast-iron stoves heating the blast to about 1000° Fahr., the economy of fuel in the blast-furnace, consequent upon the higher temperature of blast, is found, from the experience of actual working, to amount to as much as 4 cwts. of coke per ton of iron made. The amount of economy of fuel, however, that is due to equal increments of temperature in the blast, has been found by the experience of the temperatures already reached in practice to diminish rapidly as the temperature is raised; and it is, therefore, considered by the writer that the further saving of coke in the blast-furnace for a still further increase in temperature of blast from 1400° to 1700° would be less than 1 cwt. per ton of iron. With regard to the capacity of blast-furnaces as affecting the economy of fuel by diminishing the temperature of the escaping gas, the actual result now obtained at the Ormesby Iron Works, with a furnace of 20,000 cubic feet capacity, is a consumption of 20 cwts. of coke per ton of iron, with the blast heated to upwards of 1400°, and with calcined ironstone yielding 40 per cent. of iron; and assuming that the same reduction of temperature which has been effected in the waste heat escaping from the regenerative stoves by doubling their capacity would also be effected in the waste gas escaping from the blast-furnace by doubling the capacity of the furnace, it would follow that by doubling the capacity of the present large furnaces of 20,000 cubic feet the further economy of fuel consequent upon the reduction of heat in the escaping gas would be about 2 cwts. of coke per ton of iron made. In reference to the effect of increased heat of blast upon the temperature of the escaping gas at the furnace top, the working of two similar furnaces, of 20,000 cubic feet capacity each, has shown that neither extra heat nor extra driving has any prejudicial effect on the temperature of the escaping gas; and that the extra heat thrown into the furnace by the hotter blast is met by the extra duty to be performed in compensating for the diminished proportion of coke consumed per ton of iron made.

A description was then given of the Regenerative Hot-Blast Stoves employed at the Consett Iron Works, Durham, by Mr. Thomas Whitwell, of Thornaby, Stockton-on-Tees. These stoves are constructed with a series of transverse vertical walls of fire-brick, with narrow spaces left between, forming the regenerator, in which openings are made alternately at the top and at the bottom of the successive walls for the passage of the current. The waste gas from the blast-furnace being mixed with air, and ignited in a combustion chamber at one side of the stove, the heated current passes alternatively upwards and downwards through the successive spaces left between the series of transverse walls, depositing its heat in the brickwork, and reaching the chimney valve on the opposite side or the stove at a low temperature. The regenerator thus becomes highly heated on the side of the combustion chamber, but remains cool on the chimney side, and the blast being afterwards passed through it in the contrary direction takes up the heat from the successive fire-brick walls, and becomes itself heated to the same high temperature previous to entering the blast-furnace. Cleaning doors are provided in the roof of the stove, through which scrapers are inserted for scraping off the dust deposited upon the surface of the walls, and the dust scraped off is raked out through side doors at the bottom of the stove. By this means the gas dust is easily removed in a very short time, the cleaning being effected entirely from the outside, whilst the stove continues hot, without requiring to be cooled down at all for the purpose; and a small pair of these stoves at the Thornaby Iron Works have been at work for several years without requiring any cleansing of the gas prior to its use in the stoves. The saving of coke in the blast-furnace consequent upon the use of the blast supplied by these stoves at the temperature of 1400° Fahr., has been found at the Consett Iron Works, where several of the stoves have been a year at work, to amount to 5 cwts. of coke per ton of iron made, in comparison with the consumption required in a furnace supplied with blast at 850° by cast-iron stoves; and the actual consumption with the blast at 1400° temperature is less than 18 cwts. of coke per ton of iron, in a furnace making 400 tons per week, and burdened with a mixture of Cleveland and hematite ironstone, yielding 48 per cent. of iron.

GEOLOGY OF NOVA SCOTIA AND NEW BRUNSWICK.

ON TWO GNEISSOID SERIES IN NOVA SCOTIA AND NEW BRUNSWICK, SUPPOSED TO BE EQUIVALENTS OF THE HURONIAN (CAMBRIAN) AND LAURENTIAN.*

BY H. YOULE HIND, ESQ., M.A.

This paper described the relations of two gneissoid series in Nova Scotia and New Brunswick, which have hitherto been regarded as instrusive granites and syenites, and have been thus represented on the published geological maps of those provinces. The author considered that these gneisses were in the main of Laurentian age, the Huronian or Cambrian rocks occurring only in patches over a vast area of Laurentian porphyroid gneiss.

The old gneiss was stated to be brought to the surface by three great undulations between the Atlantic coast of Nova Scotia, and the Laurentian axis of America north of the St. Lawrence. These axes were rudely parallel to one another, and in the troughs which lay between them the Silurian, Devonian, and carboniferous series occurred in regular sequence, the New Brunswick coal field occupying the central trough. On the line of section in the troughs to the north-west and south-east, the lower carboniferous was stated to be the highest rock series which has escaped denudation.

The gold-bearing rocks of Nova Scotia are of Lower Silurian age, and rest either on Huronian strata, or where these had been removed by denudation on the old Laurentian gneiss. The gold is found chiefly in beds of auriferous quartz of contemporaneous age with the slates and quartzites composing the mass of the series, which, in Nova Scotia, is 12,000 feet thick; and the auriferous beds are worked, in one district or another, through a vertical space of 6000 feet. Besides auriferous beds of quartz, intercalated beds and true veins are found to yield gold, and are worked.

A series of sharp and well-defined anticlinals ridge the province of Nova Scotia from east to west, while another series of low broad anticlinals of much later date have a meridional course. At the intersection of these anticlinals the gold districts are situated, because there denudation has best exposed the upturned edges of the auriferous beds of quartz, and rendered them accessible, sometimes exposing also the underlying gneiss. Plans of Waverley and Sherbrooke gold districts were exhibited, showing the outcrop of the edges of the slates and auriferous beds of quartz in semi-elliptical forms, with the gneiss at the base of the ellipse. On this ground it was suggested that a correct mapping of the gneisses of Nova Scotia would have an important influence on the development of the mineral resources of the province.

A plan of some of the lodes in the Waverley gold district showed the result of operations in 1869, subsequently to the publication of a geological map, and sections of the district furnished to the department of mines by the author in 1868. Citations were made from the annual reports just issued of the Chief Commissioner of Mines, and of the Inspector of Mines, confirming the correctness of the author's plans exhibiting the geological structure of Waverley, which is a type of all the Nova Scotian gold districts.

Principal DAWSON spoke in confirmation of the fact that the Palæozoic rocks are underlain by Laurentian gneiss, &c., quite to the eastern coast of British North America, and stated that the same relation occurred in Newfoundland, and had been traced southwards into Massachusetts. He confirmed Mr. Hind's views generally, and stated that the lower silurian of Nova Scotia includes no great fossiliferous limestone, like that of the interior of North America. The supposed *Eozoon* discovered by Dr. Honeyman, was probably distinct from *E. canadense*, but was certainly a Foraminiferal organism allied to *Eozoon*; but a *Eozoon bohemicum* is of later date than *E. canadense*, the presence of *Eozoon* did not necessarily indicate Laurentian age.

Prof. RAMSAY suggested that other organisms besides *Eozoon* aided in building up these great calcareous masses. He enquired as to the mode of occurrence of gold, and suggested that the gold is obtained at the anticlinals merely because the exposure is better, and that it will be found to pervade the synclinals also.

Mr. HENRY ROBINSON had visited the Waverley district in company with Prof. Hind, in the winter of 1868, at which time the mining on the lodes referred to in the map before the Society was at a standstill, the lodes having been lost by reason of a fault. He thought it was very satisfactory to find that the explorations of Prof. Hind, and the theoretical position which he assigned to the lodes, had been completely verified. Mr. Robinson also stated that gold is being mined in the synclinals by sinking shafts and driving cross-cuts.

Mr. HIND remarked that all the Lower Silurian in Nova Scotia was auriferous, and that the gold was derived from the underlying Laurentian rocks. He stated that Sir W. E. Logan had indicated an auriferous zone in the Laurentian of Canada. Gold was finely distributed in the slates of Nova Scotia, as in Victoria, in the neighbourhood of lodes, according to Mr. R. Brough Smyth.

* Proceedings of the Geological Society, April 27.

OUR MINERAL VEINS.

An interesting paper upon this subject by Mr. BENEDICT KITTO, of the Breage Science Class, is given in the report of the Royal Cornwall Polytechnic Society. The Great Work Mine, situated partly in Breage and partly in Germoe, in a hollow, having Tregonning hill on the south and Godolphin hill a little to the west of north, is one of the oldest mines in Cornwall. Both Tregonning and Godolphin hills are composed of granite, and the mine between them is worked mainly in granite. The last-named hill would naturally strike one at first sight as being of volcanic origin, rising regularly, as it does, from a tolerably level piece of country; but a little observation shows it to be a hill of circumdenudation. Tregonning hill is not so regularly formed; it stretches for some hundreds of yards in a north and south direction, having a depression between its northern and southern points. Some parts of this hill are so far decomposed as to produce large quantities of china-clay and china-stone, which have been and are profitably worked on both sides of the hill. Two lodes, at least, run across this hill; these, where tried, have not produced any valuable minerals. The valley between these two hills, in which the Great Work Mine is situated, stretches down towards the east, with a very gentle slope, to the old Godolphin Mine, which a quarter of a century ago produced immense quantities of copper and tin ores; and on the west, with a similar slight descent, to the old Wheal Grey Mine, which was also rich in tin.

Great Work lode is one of the principal metallic veins of the mine, and is proved to a depth of 200 fathoms. It varies in size from 4 ft. to 1 in. wide, with an average dip of 1 ft. in a fathom north. The walls are well defined throughout. The middle of the lode consists of a "hard cab," or sparry course, and the tin is found by the side of this quartz, often for a considerable way on one side, then forming a "splice" passes over to the other side. The hard quartzose portion is *sometimes* in the side of the lode, and is a good indication when it is thrown about in the lode, but if this sparry cab disappears, the tin does also. The largest deposit of tin in this lode was found at the point of its intersection by Wheal Reeve lode, which was at an angle of about 20°. In this lode copper ore is often met with, sometimes intimately mixed with the tin, but mostly in separate stones of ore. This is chiefly grey ore, but some of it is yellow ore. This lode has been found to underlie considerably more as it nears the killas, and when it enters the latter rock becomes disordered and valueless. The killas, or clay shale, which lies to the east of the mine, is tilted considerably by the granite, and the tin shoots away under the clay shale, through which a shaft has been sunk in one place to a depth of 120 fms. from surface before striking the granite: this (eastern) part of the mine produces no tin nor copper. The killas was driven through at one level for a distance of between 40 and 50 fms.

Wheal Breage lode varies in size from about 10 in. to ¾ in. having a north underlie of about 1 ft. in 6 ft. This lode has been forked by the present company to a depth of at least 90 fms., and they have extracted large quantities of tin from parts left from a former work-

ing. He has noticed from this lode small quantities of wolfram, yellow copper ore, and fluor-spar

South Wheal Breage lode varies in size from 6 ft. to 6 in. wide, with a south underlie on an average about 9 or 10 in. in a fathom, but in some parts is vertical for a depth of 10 fathoms. This is the only vein in the mine that underlies south. This lode has been worked to a depth of 135 fms. in the eastern, and rather more than 100 fms. in the western, part of the mine, and has produced very large quantities of tin. The tin was first met with in the western part at the 24 fm. level; the lode was then from 10 in. to 1 ft. wide, in a soft, white granite. It is found that when this lode increases in size to more than 3 ft. it inclines to split up into branches, leaving "horses" between, which have generally strings of tin running through them, which make them payable to work away; but the lode, on the whole, becomes poorer. The joints or heads of granite run into and across the lode, and not in the same direction as the course of the lode, which is most productive when going through soft granite; where the granite is very hard the lode becomes poor. It is also always most productive when most vertical. It is a bad sign when small bars of hard quartz are met with, and the lode becomes "vughy." The men like to see the lode come clean off from the granite walls. A good deal of yellow copper ore and some grey ore are also found in this lode; sometimes intimately mixed up with the tin, at other times in separate stones of ore. Besides these valuable deposits the South Wheal Breage lode has produced immense quantities of iron pyrites, but no arsenical pyrites has been found in the mine.

A cross-course runs through the mine, intersecting some of the lodes at a few degrees from right angle. It is very regular in size, being wherever seen between 7 and 8 ft. wide, underlying west at about the rate of 1 ft. in a fathom. It consists of hard layers of quartz, alternating with softer "priany" layers. The layers are four in number. This great cross-course, as it is called, contains little or no metallic mineral wherever seen in this sett; but in two mines, called respectively West Godolphin and Wheal Precense, which are worked in killas, it is the principal vein for the production of tin.

The effect of this cross-course on South Wheal Breage lode is to heave it about 7 ft. north, or, as the miner expresses it, a left-hand heave. Wheal Sidney lode is heaved by the same agent about 6 ft. in the same direction. It does not exert any considerable influence on the productiveness of these lodes.

The water in which the tin is "tozed" after the first calcination in this mine, particularly that produced from Great Work lode, is drained off in cisterns, into which scraps of old iron are thrown. It is found that in four or five months considerable quantities of copper are precipitated on the iron—in fact, the whole of the iron, even if ½ in. thick when thrown in, will generally have disappeared in that time; copper precipitated from the water having taken its place and form.

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MR. WARINGTON SMYTH'S LECTURES.

[FROM NOTES BY OUR OWN REPORTER.]

LECTURE XLI.—For the purpose of further illustrating the working of stratified deposits, I should mention (continued Mr. SMYTH) that you have the advantage in this Museum of examining a series of excellent models on a considerable scale, constructed under the supervision of an eminent colliery viewer, descriptive of long wall working, and various modifications of it and pillar working employed in the North of England. From these models a great deal may be learnt by those not accustomed as yet to underground operations; and I may add that an immense fund of information is contained in the reports made to parliamentary committees with reference to accidents which have happened from time to time. The reports, too, of the Government Inspectors of Coal Mines may be studied with reference to a great number of details as to different modes of working, also in relation to the causes and results of accidents. You will by this time have perceived that the different conditions under which seams occur must affect the mode in which colliery engineers and viewers plan the workings of particular beds, and, therefore, that what may seem in such plans to be contradictory and inconsistent arises from the fact that what applies well to one seam may not apply at all to another. And so for the very same reason each system or modification of a system should be chosen on account of its applicability or suitability to the place about to be worked. The facility of removing the coal from the face of the seam where it is hewn may differ so considerably that in each case it may be necessary to vary and modify the systems practised elsewhere. If we take the case of a stall working, in some grounds we shall find that they have to put in the props so close to the face of the coal as to make it a matter of difficulty to get the coal out to the roads which may exist on either side. Indeed, it could not be got out at all, except it were drawn out on sleds, but in other cases the strength of the ground is so great as to allow of a roadway being put in between the props and the face, and thus the coal is removed in large quantities, and at a cheap rate.

We have now to consider a group of workings which are carried out when the beds are of unusual thickness. We have already seen that the working of extremely thick beds is difficult, because the removal of great masses of mineral opens out large spaces, weakening the ground about it, and causing a tendency to break away and come down, to the great risk and peril of the men employed. When there is a great deal of irregularity in the beds to be worked, some parts being thin and others thick, it is obvious that different measures must be taken for the security of the roof. In the Forest of Dean, for instance, the beds are extremely irregular. In particular bands of mountain limestone, which are often 30 or 40 yards thick, and in which the iron ore occurs sometimes many feet wide, and at other places dwindling away almost to nothing. Here when large spaces are opened out the only plan of working with security to the men, and to prevent large masses from falling in from above, is to leave pillars of the iron ore itself until the greater portion is abstracted. The Dudley Ten-yard seam of coal has to be worked by special methods, and excepting in the Department du Nord, where the coal seams are very thin, the greater proportion of all the coal of France is obtained from thick deposits of a curious character, which have been subjected to considerable mechanical action, and tilted at a very high angle, so high that it often goes into the perpendicular, and which have to be treated in a suitable manner. As far back as 1792 the system of coal mining was a matter under the consideration of the Government of that day, particularly with respect to the security of the men, and a long report on the subject will be found in the *Journal des Mines*. That report recommends taking out a limited quantity—limited, that is, in respect to height—and then dividing the part to be worked in squares, filling up the roads, and removing the pillars. It also recommended sinking the shaft on the footwall side, or on the rise of the seam, and then to drive levels from thence into the difficult ground, very much as we do with the iron ores of the hematite districts. They were then to carry drifts parallel to the footwall, and by intermediate roads to get at the coal, always excavating the whole height of the ground. In fact, it was a system, although a modified one, of what is now called "long wall." We have workings in this country of a similar character, where argillaceous iron ore is obtained from the thick beds of black shale ironstone of Derbyshire, extending over a long line of country, and valuable not only for quality, but yielding from 5000 to 6000 tons of iron per acre.

The custom in the neighbourhood of Chesterfield is to sink to the bottom of the deposit. The bed is divided into two parts by a bed of shale. Thus the first productive ground is 16 ft. thick, then there are 12 ft. of shale, containing no ore, and, lastly, a larger band of orey material 21 ft. thick. How, then, are these enormously thick beds to be worked with advantage? The great object is, of course, to get out the iron ore, and leave the shale behind. From the pit they run out drifts upon the upper band, and from these they make small stalls or openings, 6 or 7 yards across, with a similar thickness of ground between. They then work upwards to the roof, the waste being thrown down under foot. A certain area having thus been worked out, the sides and roof fall in. The ground is then left undisturbed for about a year and a half, when the lower band is worked in a similar way. If we look at the case of some of the French deposits of coal we shall find the same system, although modified, is applied in a most regular and scientific way. The coal is of great thickness, and, as I have before said, lies at a very high angle of inclination. Again, there is a remarkable instance of this kind of working at the anthracite beds on the Isere, at a place called Lackurr. The deposit is 36 ft. in thickness, and dipping at a high angle, which has given rise to a system of working which reminds one of the mode of attacking lodes by cross-cut workings. The pillars left are about 11 yards in length and 2½ metres in breadth. Having removed 5 metres, then that of the pillars takes place by first splitting them, so as to leave smaller pillars just for the time, which are afterwards to be removed. While this is going on the men are protected by pack walls, so placed that they will support the roof while the upper part of the coal is got. This is a dangerous task compared with that of opening out the lower coal, and none but the most experienced colliers are employed in this upper work. If, however, a sufficient time has elapsed after the settlement of the goaf, it is found that it may be accomplished with great security, but, of course, a good deal of timber has to be used.

Another remarkable example of this sort of working is that which I saw a few months ago at the celebrated coal seam of Montraubert, 60 ft. thick. The method employed there of late years has been to open a space, taking it in stages of 3 metres at a time, taking a drift on the outer side, and another at the upper side of the seam, the one 1½ metres higher than the other, the upper being used for the convenience of packing materials or gobbing, while the lower is used for the removal of the coal to the shaft. Pack wall materials are brought down from the surface, where, in fact, the stone is quarried, and it is lowered by a balance system, the downward weight bringing up the coal. At other times it is lowered where the coal is not being drawn, but in any case it is lowered especially for this purpose. The *remblayeurs*, so called from "remblais," the French for rubbish, go down when the colliers leave off, and they build the walls to support the roof, or the remblais is put in in the shape of pillars, so as not to interfere with the workings. Thus, for the coal they take away they fill the ground to a very great extent with refuse, and this is a system which we may expect to see adopted more frequently where valuable beds lie near the surface, the removal of which would be dangerous, or destructive to the vegetable soil, to houses, public buildings, rivers, or reservoirs. Other remarkable workings are to be met with on the curious coal field which extends from the now well-known colliery of Creuzot to Blanzy and Monseau, there being about 15 miles distance between the two first places. At the first place you will remember a remarkable bore-hole, 3000 ft. in depth, was put down, by which they penetrated the coal measures, but did not succeed in reaching that part of the seam which they expected to find. In several of the French works on mining, and especially in that of M. Burat, you will find accounts of the way in which the seam is worked at Blanzy. At that part there is a band which divides the coal into two thicknesses, and the upper is worked first. After the ground has subsided sufficiently, working is commenced in the lower coal on the system I have already described, the roof being supported by props and pack walls. Its working was found to be so difficult, and the loss of life so considerable, that it was found necessary to introduce some modification, and about three years ago, when I visited the colliery to see how the working of these thick seams were carried out, I found another method in vogue, which is certainly open to criticism, as requiring a vast amount of expenditure upon mere open spaces, but it certainly has been attended with a complete immunity from fatal accidents, which were so common before. The shaft is sunk on the footwall, and the seam reached by a horizontal drift, and from this the ground is divided into stages, which have to be worked separately, and the material removed replaced in a very great proportion by artificial packing. These divisions have pillars 10 metres square, the openings being of such a width as is consistent with security, and come up to the hanging wall, which forms a good roof, although interspersed with clay, which is apt to break down. The drift is run in the solid coal, and the great difficulty of the operation is in getting the upper pillars. For this purpose remblais is brought in, and as fast as the coal is removed it is replaced by rubbish carefully built in. The workmen thus attack the higher coal, and commonly have to protect themselves with timber, and generally succeed in getting the coal without accident. One-third of the people at work are employed in conveying and stacking the remblais; but the plan has been found to be productive of a much larger quantity of round coal than by the former one. I was much interested in observing here, after a lapse of a year and a half, the remblais settled into so firm a mass as to form a better roof than the original and natural upper portion of the strata, and with timber set at moderate distances the men beneath it worked without fear of accident.

In our own country one of the most interesting cases of working thick coal is in Staffordshire, and as far as description goes it is extremely simple, but when we come to practice it requires a great amount of hardihood on the part of the men, and of skill and care on the part of the managers, if they would avoid accidents. The coal is, on the average, more than 30 ft. in thickness, and often as much as 35 ft. The pits being sunk, main roads are driven out from the shaft on the bottom of the seam, and then there are opened out groups of stalls or sides of working, as they are called, which in a little while become great chambers. This is called square work, and it is a plan by which a great deal of coal is wasted, and a great loss of life incurred. These evils arise, no doubt, from the great height to which the openings are carried. The men work at the coal overhead on stages, or by standing on the rubbish, under and side cutting it. While doing this they listen with the greatest anxiety for any sound of "rending" in the mass, which is the precursor of a great fall, and the men often take flying leaps from the stages without hurting themselves, although the fall may be a good many yards. Alighting on the yielding slopes of the coal slack heaps below, the fall is sufficiently broken, but notwithstanding this and every exercise of vigilance, there has unfortunately been great loss of life. The bed consists of about 30,000 tons per acre, but the actual produce is codsiderably less than half of that in the first working, and from the great pressure above, the pillars and ribs, when got, yield but a comparatively small proportion of round coal. From these circumstances it was long ago argued by the late Prof. Jukes, in his work on the "South Staffordshire Coal Field," that the system should be changed, or at least supplemented by some other system; and, again, in Smith's "Miners' Guide" it is shown how objectionable this system had been, and proposed to work by levels in which the coal would be got by a succession of steps. Such a method would be coupled with no insuperable difficulty; but since 1830 another sort of plan has been employed in a few instances in the southern part of the Staffordshire coal field. Under it the men are protected on both sides with pack walling, and the coal is got with great facility. This method is carried through the upper half of the seam, and the roof is allowed to come down. When the latter is in a state of rest—that is to say, in 15 or 18 months—the ground beneath is opened, and worked by another system; and there is no more difficulty in dealing with the roof than in the previous operation. At all events, it is but a matter of a few more props, and of placing the pack walls a little nearer to each other. By this change more round coal is obtained, there is less waste, and there have been fewer accidents than under the older systsm.

LECTURE XLII.—The next point in practical mining to which our attention is required is the conveyance underground of the mineral from the place where it is broken from its original bed to the bottom of the shaft. The methods by which this is effected vary from very simple and rude contrivances to machinery of an elaborate and highly effective character. The Germans designate this work by a special term—"fördenung"—and the earliest mechanical improvements in it were brought into use in the North of Europe. In the olden times, when the quantities to be removed were but small, and the distances moderate, such simple means as baskets carried by men, or boxes dragged along the roadways, were used; and in Spain, Turkey, and Greece to this day primitive methods are still in use which would be wholly unsuitable to the larger quantities of material to be removed, and the higher rates of wages which prevail in England and France. Thus, in the mines of southern Europe men, women, and children hand the metalliferous earth in baskets one from another, and even in this country under certain circumstances a great deal of mineral is conveyed in this way. For instance, in some small lead mines you may see the whole operations of the mine going on without even as much as a wheel-barrow being used, the material being handed about in buckets, just as in the most primitive times. This system, passed down from father to son, has held its ground on the Continent by reason of the abundance of coarse grasses and other materials, of which the baskets can be made at a cheap rate, and the difficulty of getting wood and iron work done with the facility which is usual in this country. Up to recent times carrying the mineral in baskets was not unusual on the other side of the Tweed, where it was called "bearing coal," and was performed by women, who carried it on their backs up ladders and along the levels. This system was put an end to by Act of Parliament in 1843; and it has now completely departed from this country, except in some few instances in the Forest of Dean, where, owing to the irregular character of the deposits of ore, no other mode of carriage can be adopted. In South America Indian labourers are employed, who often carry amazing weights for very long distances; and there is in the Museum upstairs a mass of silver ore 300 lbs., which a man carried on his back up a shaft 45 yards in depth. In our own country the practice, as I have said, is limited to the irregular iron workings in the Forest of Dean, where a sort of wooden tray, with an iron rim, is employed, on which from ½ cwt. to 1 cwt. of ore is packed, and then carried on the shoulder and fastened with a strap, leaving the hands at liberty to assist in climbing ladders. Of course, any such system would be inexcusable except, as in this case, some peculiar irregularity in the beds of ore may exist; or in driving levels, where the miners may come to ore on a small scale, too valuable to be left and not enough to make it worth while to sink or drive to it; and where, therefore, they follow just wherever the ore leads them, and it is carried out by boys. The next step after baskets and trays was the adoption of sledges. In stratified deposits these are divided into two classes—one applicable to the removal of the coal along the face of the workings to the roads, where there is often very little space, where the admission of carriages is impossible, and where, consequently it has to be dragged some distance; and the other employed is what is called "putting" or "hurrying," by which the coal is pushed along on some sort of a wagon or tram. It is a remarkable fact that more than a century ago, in the better conducted mining districts of the Continent, four-wheel carriages came into use, and even rails for these four-wheeled carriages. One of the earliest of these was called the "dog," or "hund," which was employed in Germany 300 years ago, and is largely used to this day. It is made broader at the bottom than at the top for the sake of giving it greater stability. The wheels in the fore part are small, but the hinder are larger, and placed just in front of the centre of gravity. It is driven along a pair of planks placed just so far apart as to suit the wheels. It is raised to a horizontal position by the tram-man on to the pair of centre wheels, and driven with great celerity and dexterity in turning corners, and at a considerable speed. Planks laid on the floor for the wheels of the hund were a sort of rail, which have been long in use in Germany, and the wheels were made flat on the edges to prevent wear and tear. Keeping the wheels each on a single plank about 8 in. wide required considerable address, and in clumsy hands the hund would occasionally run off the line, an accident which occasioned great inconvenience where the planks were carried over softish ground, or in the adit level over water, and to prevent this iron pins were attached to the axle, which had a bearing on the inner edge of the planks, and so prevented the carriage from running off. This system probably suggested the idea of employing narrow wheels and iron rails. The changes from rough plank tramways to wooden rails, and from them to cast-iron tramways, and then to rails, were gradual, the latter being common underground many years before they became familiar to the world aboveground. It is more than a century ago since a writer of that period, Dr. Brown, described his amusement and admiration at seeing the great pace at which the trammers were even then able to attain in pushing the carriages before them. In England the first marked improvement was the introduction in the North of England collieries of what are called rolleys, or carriages on broad wheels, which were made so as to be lifted up the shaft without emptying—a system not yet extinct in the Midland collieries. In the thick coal there they use a great skip, with a barrel of cast-iron, on which the coal can be filled to a great height, being kept in places by stout rings of iron, and thus allowing a ton and upwards to be moved at once, and by means of a strong bar of iron attached it can be drawn up the shaft.

In metalliferous mines great use is made of wheel-barrows, which are made of all sorts of patterns to suit the width of the levels; but in collieries, where large quantities of material have to be moved with rapidity, rails are now invariably laid down. It was, however, not till towards the close of the last century that much was done in this direction, and when smooth and regular rails of wood were laid down in the Alstone Moor district they were thought a great improvement, and a model for the rest of the world. The system was found to have many advantages over that of driving sledges, mounted on narrow-wheeled carriages. The next step was to put on flanges on the broad wheels, and at last, towards the end of the last century, Mr. Carr, of Sheffield, laid down iron tram-plates, by which means instead of the coal being removed by single corves, a horse could draw a dozen at once. In considerıng the changes and improvements which from time to time were introduced, it must be remembered that the roadways or levels in mines are very different to roads on the surface of the ground. The floors always have a certain amount of unevenness and sinuosity, and are subject to disturbance from creep, so that there are difficulties to contend with which do not appear at first sight. After a time it was found that the friction of broad wheels even upon iron tramways was so considerable as to be inconsistent with economy, and edge rails were proposed. In 1824-5 edge rails of wrought-iron began to be used, and soon acquired a great reputation wherever the quantities of material to be removed were large. Experiments then followed as to the best forms of the flange principle. At first the common T-rail was used, with a flanged wheel fitted to a longitudinal sleeper. Bridge rails then came into play, and were found very useful, and other forms each have their advocates. These rails are laid at different widths, varying according to the amount of traffic passing over the lines, and the width and style of the wagons employed.

The shape and dimensions of the wagons or corves present infinite variety, inasmuch as, besides being made convenient for transit in the levels, the lifting of the mineral through the shaft has to be considered. Formerly the coal was unloaded from the wagons by which it was conveyed along the shaft, for the purpose of being raised through the shafts and then delivered. This system is now considered most undesirable, and it has given way to others. The coal is now loaded into smaller wagons, or "tubs," which can be handled with gr at facility. A great diversity of practice prevails, but the practice I now speak o holds good in all the large workings of the North. The wagons run on edge rails, and their load weighs from 6 cwts. to 10 cwts. of mineral each. They are harnessed together in a train as long as a horse can draw, which is thus brought from the place at which the coal is got to the foot of the shaft. Each wagon, with its tub, wheels, cargo, and everything else, is run on to a framework called a cage, which cage is raised by the drawing machinery to the surface. It certainly seems objectionable that engine-power should be expended in drawing carriages, wheels, coupling gear, and everything else thereunto appertaining up the shaft, but, nevertheless, it is found in practice to be so much better than unloading the wagons and loading a skip that the system has come into general use. If the roads are on an incline to suit the dip of the coal then it may be necessary to have special arrangements below for running the wagons, and in such cases the following plan is adopted:—They have two roads side by side, driven out to the actual workings, where the coal is loaded into trams. It then becomes a question as to getting the coal along the incline which, with more or less steepness, runs to the main roads. If the roads are horse-high, and the workings less than horse-high, Shetland ponies are often used. Where the inclination is considerable, "putting" is undesirable, and horse-power becomes indispensible. Where the coal, as usual, is worked from the mainways up the rise of the seam, if the inclination be as much as 1 in 30, inclined planes (jinny-roads or jig-brows) come into use, where by aid of a drum or a sheave at the upper end, regulated by a brake, the loaded tubs run down by their own weight, and pull up the empty ones; or the descent may be checked, and the ascent assisted by the use of a counterbalance tub, suitably loaded. The sheave for this purpose may, according to the nature of the work, be so fixed by the aid of wooden props as to be easily moved forward as the workings advance. This is, of course, a very inexpensive mode of conveying the coals, and is sometimes applicable for very long distances, although for the avoidance of accidents it is needful then to establish a very strict discipline as to signalling when the train of tubs is to be set running, and also to have side-stalls cut out here and there for the safety of those men who may happen to be travelling the plane at the time. In the rudest of such inclines a boy goes down with the sled, digging his heels into the floor by way of a drag, whilst in large and well-laid collieries a regular series of such inclines, fitted with substantial brake-drums, wire-ropes, and friction-rollers for them to run upon, vie with the best of inclined planes to be seen at the surface. A contrivance of great ingenuity—Fowler's clip-pulley—has been most successfully used by Messrs. Pease, at the Upleatham Mines, for two years past, and appears to be capable of extended application in the working of inclines, and engine-planes in collieries also. Its advantages are that the rope need only to be passed simply over the periphery of the wheel, instead of being coiled or lapped round it as on a drum; that it then holds the rope more equally and advantageously without flattening the wires or grinding them one against the other, and that it prevents a surging movement. The moveable clips on the circumference, which embrace the rope, clutch it so tightly that on a double incline one set of tubs may be thrown off—as by the breakage of the rope—and yet it is capable of sustaining the other. They are largely used at the surface, and no doubt play a very efficient part. These clips do not produce any material wear and tear of the rope.

Another point which has excited much attention is how to obtain the greatest advantage from the labour of horses in drawing, and to that end what are the proper gradients for the roads, and from 1 in 130 to 1 in 160 has been fixed upon. A horse will draw three wagons, with 1½ ton of coal each, the wagons themselves each weighing from 8 cwts. to 10 cwts. additional, at one gradient, while he will draw seven wagons of similar dimensions by slightly altering that gradient. The late Mr. Nicholas Wood made a long series of experiments on the comparative rates of drawing aboveground and below, the results of which are published in the Transactions of the Northern Institute. He showed that the maximum work which can be done by a horse dragging a carriage on a level railroad at the surface was 133½ tons one mile in a day. But what is the actual amount done? 100 tons would be an excellent performance with the rails in good order, and the wheels 3 ft. in diameter, but from 30 to 50 tons per horse, or less than half, is all that is accomplished in the mine. One reason for this is the irregularity of the roads, the impossibility of maintaining them level, the numerous stoppages, and other hindrances—indeed, the work actually done is often not more than one-tenth of what could be done aboveground. Considerations of this kind have led to the abandonment of horse-power in large collieries to a great extent, and the adoption of steam-power.

LITERARY NOTICE.

Biography of Dr. Sheridan Muspratt. By W. WHITE, Hon. Mem. de Société d'Encouragement des Arts et d'Industrie. London: Nicholls Brothers, Great James-street.

In the title of this ably written *brochure* we recognise an old and valuable contributor to the *Mining Journal.* The subject he has chosen is also one which renews associations with a "citizen" of no mean city (Liverpool), and one who has, by his discoveries and his writings, conferred inestimable services upon the arts and manufactures of which we proudly profess to be the faithful exponents. Ever steady to the text which, in his "History of Chemistry," issued so far back as 1838, and renewed in his "Hints from a Chemist," in 1854, Prof. White forcibly instances in the case of the subject of his present memoir, the culpable indifference of those to whom are delegated the powers of recognition of the services of science towards its devotees. Upon this branch of his subject the writer pertinently remarks—"Titular honours have recently been rather amply apportioned. It appears, therefore, strange that the discoverer of this sanative adjuvant (the now celebrated pro-chloride of iron spring at Harrogate)—*the greatest achievement of modern science*—should have remained so long unrewarded. Hitherto, beyond a trivial local compliment, about to be inaugurated, no guerdon or requital appears to be forthcoming, either as indemnity or incentive. The commonwealth derive incalculable advantage. For incomparably minor benefits, conferred by citizens, the State has frequently admitted its obligation by the concession of titles. The great benefactor of his race is inexplicably overlooked. It may be said of Dr. Muspratt that 'not for himself, but for the world he lives.' How admirably does he at present realise Virgil's inimitable sarcasm, '*Sic vos non vobis.*' To no section of workers in the busy hive—carrying out one of these similes of the Latin poet—do these lines so aptly apply as to that of which the Doctor is so illustrious a type. Their mental labours are incessant, and demand the exercise of all the powers of the intellect. Analogical reasoning, capacity, conception, percipience, judgment—all are called into active requisition; whilst for manipulation, patience, skill, perseverance, experiment, discrimination are equally rendered subservient. What, then, are the distinctions merited by successful application of these mental and physical faculties? These qualities, appreciated as they ought to be in these advanced times of practical application of science, should be distinguished according to the requirements of the candidate. The more affluent of this order, with the influence which wealth judiciously circulated properly commands, would reflect honour upon the distinction, and stimulate the less fortunate to renewed exertions. In political life it is proverbial that, as a general rule, elevation to the Upper House is equivalent to the subsequent loss of active partizanship; in science experience has verified an opposite result. Metropolitan and provincial magnates receive titular rewards for mere political proclivities, or from fortuitous circumstances accompanying a civic feast. A learned professor aids the State by a discovery of the most vital importance, not through accident, but by long and intense study, his claim to reward is deferred or entirely ignored."

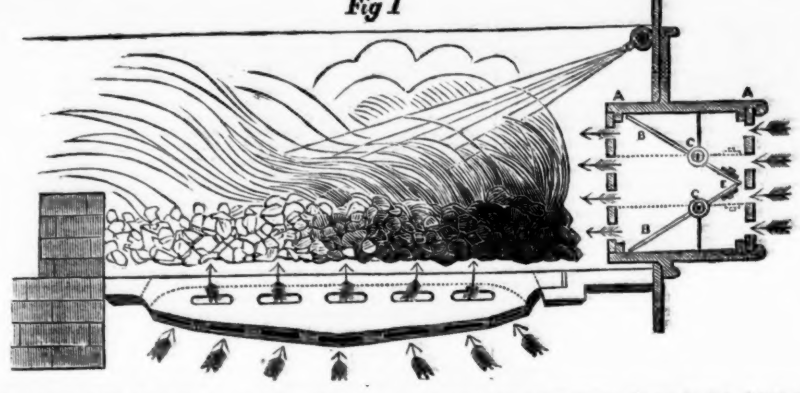
We have had occasion to speak in terms of high commendation of the celebrated work, "Chemistry, Theoretical, Practical, and Analytical," edited some 15 years ago by the Liverpool Professor. Referring to the results of the past labours of Dr. Muspratt in this engagement, Mr. White enlarges upon the Dictionary in a way which shows his powers as a critic, and which cannot be otherwise than highly flattering both to the author and publisher. He says—"Mr. Mackenzie, the eminent publisher of Glasgow, Edinburgh, and London, a gentleman whose commercial enterprise and discriminating skill have, upon various occasions, suggested the issue of works of sterling merit, under the supervision of men of acknowledged ability, projected a Dictionary of Chimistry upon a scale which would supply a vacuum long experienced, especially amongst those manufacturers whose processes depended, in a great measure, upon the application of chemical laws. This, to be of universal value, must needs be comprehensive to be available to the ordinary workman; it must be written it the most intelligible style. The keen perception of the bibliopist was instantly directed to the learned Liverpool Professor. The decision has not falsified the judgment of the publisher, nor the sanguine expectations of those for whom the work was contemplated. On the contrary, the author has produced a cyclopædia of the chemical arts which, exhaustive of the numerous subjects under consideration, has conferred additional lustre upon an imperishable name. Independent of an immense circulation in those countries where Anglo-Saxon is the mother tongue, Dr. Muspratt's Dictionary, in a translated form, has become the text-book to the arts and sciences over France and Germany, and figures as the favourite authority amongst analogous publications of foreign States, whilst it is acknowledged as the only perfect *vade mecum* extant. As a practical guide, its merits have secured the concurrent approval of most of the celebrities, and elicited their admiration in unqualified terms." But it is not only in the record of events, such as have rendered famous the hitherto active career of Dr. Sheridan Muspratt, that Prof. White has displayed his accredited talents as a writer. We are fain to commend his mode of reasoning, and the deductions emanating therefrom, together with the forcible and attractive style of language which characterise the whole of the 32 pages of his production. As illustrative of style, we venture to give the following remarks gathered from the opening and closing of the biography; our readers will then be enabled to determine the soundness of the judgment which encourages the hope that ere long we may again hail the writer in the arena of literature, communicating his ideas upon subjects of interest, or recording the experiences of his own active professional career:—"It may be conceded," reasons our biographer, "that amidst the memoirs which have hitherto excited the most profound interest, especially with the juvenile community, those of warriors are the most popular. Martial deeds and hair-breadth escapes produce an immediate and lasting impression; they assimilate vividly with adolescent notions of heroism and ardour, kindle the latent spark of emulation, and savour strongly of that spirit of chivalry indoctrinated by early perusal of the almost miraculous prowess of the ancients and the glorious achievements of our ancestors, when the tenure of property and rank was maintained by the persuasive eloquence of the sword and the battle-axe, when right was absorbed in the more genial argument of might, and society acknowledged—

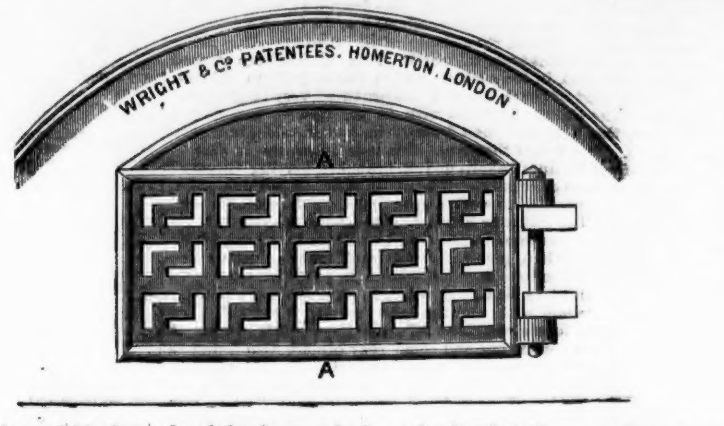
'The simple plan,
That they should take who have the power
And they should keep who can.'

In these days, with steam's devious control producing fabrics delicate as the gossamer web, or exerting a colossal strength; electricity annihilating time and space, and realising the 'Immortal Bard's' predictions of putting 'a girdle round the earth in 40 minutes,' and constituting the very 'highway of thought;' and light rendered subservient to the mirror's talismanic power, and with a

SELF-REGULATING FURNACE DOORS.

Fig 1





For many years past the importance of preventing the emission of smoke has been very generally recognised, not merely to avoid the nuisance, but from the knowledge that every particle of smoke escaping to the chimney represents a corresponding waste of fuel. For supplying sufficient yet only the necessary amount of air to furnaces, an improved self-regulating door was some time since patented by Messrs. WRIGHT and CO., of Homerton, and as the doors have given the greatest satisfaction in the several establishments in which they have been applied, a description of them will not be uninteresting.

In the annexed diagrams, Fig. 1 is a longitudinal section of the furnace door, showing the action of the valves or blades, which are placed in the thickness of the door. These valves consist of two balanced plates, B B, extending nearly its entire width, and working on a sharp or knife edge, C, like the centre of a scale beam, carrying at the outer edges a weight, which is regulated by set screws, E. The second figure is a front elevation of the door; A A are air passages through the front plate of the door, which plate works in a groove, and can be withdrawn to regulate the set screws, E, of the counterbalance weights of the valves.

Under ordinary circumstances, especial attention on the part of the stoker is required each time of firing, and it is well known that this attention is not at all times given—the improved furnace door renders it unnecessary. When fresh fuel is thrown on the fire, and the door closed, the draft through the bars is momentarily checked, the uptake of the shaft continuing the same, a slight vacuum is formed in the furnace, the external pressure impinges on the blades or valves, admitting the air in proportion to the requirements of the furnace, until the draft is re-established between the bars by the fuel burning clearly, thus again admitting air between them. The valves will then close gradually, totally, or partially, according to the amount of air required. The valves being once adjusted by the counterbalance weights, by means of the set screws, to the draft of the furnace, require no further attention. The bearings of the knife edges being large and of case-hardened steel, are not liable to get out of order.

In most cases the self-regulating door is found to be sufficient, but in exceptional cases the draft can be accelerated by superheated steam, by a mode of application also patented by Messrs. Wright and Co. The steam is projected from nozzles placed in a tube situated over the door, either inside or outside the furnace front, according to the facilities for placing it. The effect of the apparatus in preventing the emission of smoke will be seen from the different shades in the first figure of the diagram. The palpable black smoke is gradually converted into colourless gases, such as carbonic acid and the gaseous products of perfect combustion. The dotted lines show the degree to which the valves in the door can be opened. The doors have been applied in the Dockyard and Arsenal at Woolwich, and have given equal satisfaction for their economic results, and for the labour they save to the stoker. They appear to be equally applicable wherever steam-power is employed.

faithfulness which the highest grade of art cannot reach, nor the mightiest efforts of genius accomplish, delineating upon a textile substance a perfect fac-simile of the desiderated object. Even in these days of advanced science and art our diurnal literature teems with the exploits of the warlike section of the body politic. Passages of arms are constantly paraded before the reading public, whilst rumour, with its clarion tongue, proclaims the issue of mortal combat amongst the nations of the world."

One other extract, and we leave this interesting memoir, with the assurance that 1s. spent in its purchase will prove "a safe and profitable investment," and its perusal will well repay the time it occupies. "In preferring the claim of Dr. Muspratt to some early acknowledgments of his talents and service to the State, it may be cited that 'no communication or gift can exhaust genius.' Men in general undertake enterprises of labour and expense with the speculative idea of augmenting wealth. This is not the disposing cause with the Liverpool Professor. With him the more spiritual influences are the motive power—the gratification of his own inherent taste, the advancement of science, and a laudable ambition to acquire an imperishable name.

'The spur which the dull soul doth raise,
To spurn delights and live laborious days,'

or, in other words, 'fame, that last infirmity of noble minds.'"

FOREIGN MINING AND METALLURGY.

The French coal basins in the departments of the Nord and the Pas-de-Calais remain in much the same state; in other words, sales have not fallen off, and the extraction is pushed to its utmost limits. Orders are abundant, and without taking account of contracts which may be expected to be renewed, the contingent of business now on hand is sufficient to absorb for some time to come all the coal that is likely to reach the pit's mouth. Negociations with reference to new contracts are being continued more actively than ever, and a good number have already been concluded at remunerative rates, and on terms which show some advance upon the prices of last year. Deliveries, both by railway and by navigations, have not at all diminished in activity. At Paris the coal trade may be said to be in a somewhat favourable state.

The Hungarian Government is stated to be disposed to enter into an arrangement with some foreign company for the working of the iron and coal mines situate in the Vajda-Hunyad district. The Belgian Government has received from its representative at Vienna a very copious and detailed "memorandum" upon the subject. The Hungro-Belgian Company for the Construction of Machinery and Ships is to go into liquidation, the shareholders having passed a resolution to that effect. A committee of liquidators has been appointed, and has commenced its operations by inviting the creditors of the company to consent to a delay in the settlement of their claims.

The Belgian coal trade has not experienced any material change. The extraction has been slightly diminished, and the tone of prices is one of much firmness. Freights remain without any variation, although boats are somewhat scarce on the principal lines. Both casting and refining pig are being disposed of at present in Belgium with great facility, and several establishments have resumed the production of casting pig, which has long had to suffer from English competition. Prices have been fairly sustained at 3*l.* 16*s.* per ton, No. 5, with a scale of 2*s.* per number. Iron for construction purposes is also in good demand, but merchants' iron has suffered some little depression, and some orders have been accepted in the Charleroi group at a slight abatement from the quotation of 6*l.* 16*s.* per ton previously current. The state of the Belgian rail market continues exceptionally good, thanks to the numerous orders in course of execution. A quotation of 7*l.* 4*s.* per ton is maintained, but it must be added that for some time past no fresh contracts of any importance have been secured. Plates continue in considerable demand; they are quoted at 9*l.* 4*s.* per ton for ordinary qualities, and at 10*l.* per ton for boiler-plates. It is understood that important modifications as regards the caution-money to be deposited, and the period prescribed for delivery, will be introduced into the specification relating to the adjudication of rails for the Belgian State railways. This adjudication was to have taken place on April 13, but was adjourned, no tender having been submitted. The sale of gas effected by the Belgian General Company for Lighting and Heating by Gas amounted in the seven months ending March, 1870, to 258,902,352 English cubic feet, as compared with 242,497,071 English cubic feet in the seven months ending March, 1869, showing an increase of 16,405,281 English cubic feet in 1869-70. The United Collieries of the Lower Sambre Company will not pay any dividend upon its share capital for 1869. The Belle Vue Colliery Company is distributing 14*s.* 10*d.* per share as its second dividend for 1869.

There is little change to report in the state of French metallurgy. Everywhere a satisfactory current of orders prevails, and there is considerable activity in the producing groups. In the Haute-Marne prices are maintained with firmness, charcoal-made pig for refining bringing 4*l.* 16*s.* to 5*l.*; mixed pig, half coke-made, 4*l.* to 4*l.* 4*s.*; coke-made (Meurthe and Moselle), 3*l.* to 3*l.* 0*s.* 10*d.*; and casting-pig, No. 1, good marks, 4*l.* 12*s.* to 4*l.* 16*s.* per ton. As regards rolled-iron, we may add that first-class merchants' iron, from charcoal-made iron in warehouse at the works, has made 9*l.* 4*s.* to 9*l.* 12*s.* per ton; ditto, second quality, 9*l.* to 9*l.* 4*s.*; ditto mixed, first quality, 8*l.* 12*s.* to 8*l.* 16*s.*; ditto, second quality, 8*l.* 12*s.*; ditto coke-made, first quality, 8*l.* to 8*l.* 4*s.*; ditto refined, charcoal-made and rolled, 12*l.* 16*s.* to 13*l.*: ditto, ordinary grained iron, 11*l.* 4*s.* to 11*l.* 12*s.*; ditto, fine grained iron, 12*l.* to 12*l.* 8*s.* per ton, with a scale of 8*s.* per ton per class. First-class sheets, coke-made, have brought 9*l.* 8*s.* to 9*l.* 12*s.* per ton; ditto, first-class charcoal-made, 10*l.* 8*s.* per ton, with a scale of 8*s.* to 16*s.* per ton between the classes. Merchants' iron and special iron have been very well sustained in the Moselle, and have given rise to considerable transactions; it has been the same with rough pig, which has brought 2*l.* 17*s.* 6*d.* per ton; the firmness in this article is explained by the rise in coke. It is understood that the Pont-à-Mousson Works have received an order for 1700 to 1800 tons of pipes to be made for the town of Brunn. The Moselle forges have been doing less business with Germany than hitherto, since they have to contend with a formidable amount of Belgian competition upon the German markets. The Paris iron market has shown symptoms of reviving, and it is generally anticipated that the season which is now commencing will not prove less profitable than that of last year; building works have been resumed, and will be generally pushed forward with activity. The total quantity of pig and castings imported into France in the first two months of this year has been officially returned at 22,816 tons, as compared with 21,692 tons in the corresponding period of 1869. The quantity of iron and plates imported in the first two months of this year was 13,855 tons, as compared with 8403 tons in the corresponding period of 1869. The quantity of iron minerals imported into France in the first two months of this year was 75,119 tons, of which 18,661 tons were derived from Belgium, 16,585 tons from the German Association, and 27,820 tons from Algeria.

The tendency of the French copper markets continues favourable. At Havre there have been rather numerous transactions in Chilian in bars; the price, as well for disposeable as for lots to be delivered at the close of May, has been 70*l.* per ton, Paris conditions. The German markets have been generally firm, and prices have been well sustained; for the rest, it may be observed that stocks are somewhat reduced. The French tin markets have presented little change; in Germany the article has been rather firm. At Rotterdam tin has been very quiet; some transactions in Banca have taken place, at 78¼ fls. to 78½ fls. There is scarcely any change to report in lead or zinc.

M. Thiers has returned to Paris from a short visit to the Département du Nord, whence he derives the greater part of his income. The coal mines of Anzin, which belong to a few shareholders, annually yield enormous profits, the dividends being several thousands per cent. on the amount of the shares.

THE MINERAL WEALTH OF TURKEY.—The mines of the Smyrna district are numerous, consisting of emery, coal, iron, lead, and chrome ore. The emery mines are very productive, but the system upon which they are rented and worked is very defective. The coal is chiefly lignite, but is useful for steam purposes. The salt works have produced in the year about 26,000 tons of salt, leaving a profit to the imperial treasury of about 130,000*l.* The price is 1 piastre per oke, or 2d. for 2¾ lbs.

THE MINERAL RESOURCES OF ITALY.—In the consular district of Genoa the copper mines are reported by Mr. Acting-Consul de Thierry not to be making any progress to speak of, the ore being found in bunches or pockets, dispersed without regularity throughout the serpentine. The ore exported in 1868 averaged about 12 per cent. copper. The total quantity of ore exported from Sestri Levante was 1737 tons. About 725 tons of copper ore were also exported from Genoa, making the total export from this consular district, for 1868, 2462 tons, against 2005 tons in 1867. The Lombard lead mines did not give good results, and only 120 tons of ore were exported during the year. A company, composed of a small number of shareholders, have begun operations for discovering the extent of ores in the neighbourhood of Spezia, and towards the west. Manganese in remunerative quantities has been extracted and exported. Copper ore also exists, but it is not yet known in what quantity. The lead smelting works of Messrs. George Henfrey and Co., at Pertusola, in the Gulf of Spezia, continue in active operation day and night, and form the largest and most complete establishment of the kind in Italy. All the ore is imported from the island of Sardinia, and the quantity annually smelted is estimated at 7100 tons, valued at 66,400*l.* The yield of these works for 1868 was as follows:—Pig-lead, 4620 tons, value 90,600*l.*; silver, 2½ tons, value 23,200*l.*: making a total of 113,800*l.* The works at Pertusola consume annually about 3000 tons of English coal, the remainder of the fuel required at the works comes from the lignite mines at Sarzanello and Caniparola, which also belong to Messrs. George Henfrey and Co. These mines can produce 1000 tons of fuel per month, and give occupation to about 200 labourers. About 100 men and 40 women and children are employed in the lead works of Pertusola, the wages of the men varying from 2 lires to 3·50 lires per day, and the average wages of the women and children being 80 cents. per day. The whole of the lead is sold in the markets of Italy; the silver is sold in Turin, Marseilles, and Paris.

FOREIGN MINES.

ST. JOHN DEL REY.—Morro Velho, March 29: Morro Velho produce, second division of March, 11 days, 2232 oits.; yield, 1·650 oits. per ton. Gaia produce, second division of March, 11 days, 147 oits.; yield, 1·000 oits. per ton. New shafts sunk during March.—"A" shaft, 4 fathoms 1 foot 3 in.; "B" shaft, 5 fathoms 4 feet 6 in.—total, 9 fathoms 5 feet 9 in.

DON PEDRO.—Mr. F. S. Symons, March 29: Produce weighed to date, 4363 oits.; estimate for month, 5300 oits. Stopes have yielded better general work in the latter than in the first division of month. Line in No. 6 has not improved, and the lode in Alice's west presents no change. We are pushing on with the works for ventilating this section. A commencement has been made to stope reserve underlie lode, and encouraging samples have been taken. The deepest point in the mine worked on at present is the Canoa, in underlie lode, and from this point, owing to water, but a limited supply can be broken; but, to show that in depth our lode maintains its auriferous quality, on the 25th five boxes of vein stuff were taken from it, which yielded 500 oits. of gold. The horse-engine works well, but water is increasing in the shaft, and it is very trying work for the animals. As yet we have not lessened the water in the stopes.

ANGLO-BRAZILIAN.—Mr. F. S. Symons, March 29: Little alteration to note; works have progressed steadily. The lode at Dawson's maintains its good size and favourable appearance; the other parts of the mine as last reported on.

ROSSA GRANDE.—Mr. Ernest Hilcke, March 28: During the latter part of the month the features of the lode at Mina de Serra are not looking so promising as when last commented on. The size of the lode in the stopes below the 60 is diminishing fast, and that in the eastern end of this level has nearly died out, but, as the extremity of the shoot is considerably further east of this point, we undoubtedly shall, by extending the level, meet with a good size lode again. In sinking the shaft I am pleased to say the lode continues of good size and appearance. The large lode recently discovered at the Cachoeira Mine has not been tried as I could have wished, owing to deficiency of force; however, sufficient stone has been treated from this lode to prove that it is too poor for working same at present, when our force can be employed to far greater advantage at other points of more importance.

GENERAL BRAZILIAN.—Capt. Thomas Treloar, March 28: I have nothing of moment to communicate. All is going on satisfactorily. We have had some heavy showers of rain, but even so our surface operations have advanced apace. The adits are progressing fairly, but the ground in the shallow adit at St. Anna continues troublesome. In explorations nothing new.

TAQUARIL.—Mr. T. S. Treloar, March 28: Our operations at all points are proceeding with regularity. At the cross-cut northward from engine shaft, commencement of which was advised in my last, 12 fathoms have been driven. Jacotinga of promising appearance is now coming in, and in the course of another week we shall probably intersect the lode. In the deep adit the ground is more favourable for quarrying. A troop rancho and stables, and accommodations for bullock drivers, have been commenced. The erection of pumping machinery and remaining works are progressing satisfactorily.

SAO VICENTE.—Capt. Martin reports:—At the jacotinga formation I have not much change to report; the points of operations are looking much the same, except in No. 5 level, where we have got through the clay and canga, and in the upper part of the end we have intersected a bed of jacotinga, and from the dip as the level advances it will soon get down in the end.

ANGLO-ARGENTINE.—Capt. Joseph Vivian, March 15: South Mine, Capitan: The main lode, intersected in the cross-cut in the base of the hill, has been driven on 15 ft. 6 in., and the footwall is not yet reached; the lode is still looking exceedingly well.—Machinery: The first troop of carts, with about one-third of the machinery, is expected to arrive here this week; they left San Juan last Friday, all well.

ECLIPSE (Gold).—The following is from the *Scientific Press* (San Francisco) of April 9:—*Sale of an Owen's River Mine.*—We received a call a few days since from Capt. James Barratt, mining engineer, London. Capt. Barratt has visited this State several times as agent for English capitalists, and is now here again in the same interest. We are pleased to state that his present visit has culminated in the purchase of a very extensive mining property, known as the Eclipse Mine, and located at Independence, Owen's Valley, near Owen's Lake. The purchaser is in the interest of a mining association in London, known as the Eclipse Gold Mining Company (Limited). We had occasion several times to refer to this mine four or five years ago, while it was being developed by means of a small mill, under the supervision of Capt. Joseph Endy, of Grass Valley; and we are pleased to learn that Capt. Endy has been associated with Captain Barratt in the management of the property under its new proprietorship. Messrs. Balfour and Guthrie, of this city, will act as agents for the company in San Francisco. The most improved and substantial machinery will be at once placed in operation at the mine, which, we understand, comprises a heavy gold-bearing ledge, of well-developed value. We hope the new company will meet with the highest measure of success, and take rank with the best on the coast.

PESTARENA UNITED.—Pallanza, May 3: A remittance of 548 ozs. of gold have been made for the month of April.

RHENISH CONSOLS.—Capt. Sweet, May 3: Christiania: The driving west on the footwall of the lode, in the 30 lachter level, is still unproductive, though we think the lode is presenting a better appearance, and letting out a great quantity of water. We have cross-cut a few feet in the footwall, but have found only layers of sandstone. A stope in the roof of the 20 lachter level, on the south part of the lode, and 15 lachters west of cross-cut, will afford 1¾ ton of lead ore per lachter. A stope on the north part, at this point, will afford 1¼ ton per lachter. A stope in the roof of the 10 lachter level, west of cross-cut, will afford 1¼ ton per lachter.—Bleibach: The driving west on the north lode, in the 10 lachter level, is still poor. As we have not the whole of the lode in the end, we intend to cross-cut to the hanging-wall before extending further on. A stope in the roof of the 10 lachter level, on the north lode, east of No. 3 winze, will afford 15 centners of lead ore per lachter. A stope in the roof of the adit level, on this lode, will afford 8 centners of lead ore and 12 centners of blende per lachter. Stopes Nos. 1, 2, and 3, in the roof of the 10 lachter level, on the middle lode, will each afford 1¼ ton of lead ore per lachter. In the driving north, on the copper lode, we have found, mixed with the flookan on the hanging-wall, particles of lead ore.—Madonna: The forebreast of the cross-cut is very near the lode, the end being crossed with small veins of rich lead ore. Directly the lode is cut through I will advise you of it.

[For remainder of Foreign Mines see to-day's Journal.]

THE ST. JOHN DEL REY, AND THE TAQUARIL GOLD MINES.—On my arrival at Morro Velho I was met by the two mining agents, and pressed very hard to take up my lodgings with them. When I got to my friend's house I was surrounded by a host of Cornish neighbours, saying—"Will you come and dine with me?" "And breakfast with me?" On Christmas-eve I went up to the mine, and to the Casa Grande. They were all as alive and busy as could be, some about one thing, and some about another. I went to the smiths' shop, and found three of the old and experienced hands whom I had left there 17 years ago, apparently inclined to "live old and die fat," according to the toast in drinking a glass of punch, with which a great many of your readers are acquainted. I next went to the carpenters' shop, and was received with the same kindness; all there had been serving the company from ten to twenty years, all in perfect health, and looking much younger than they would have done had they been working in Cornwall for such a period. I could not see much alteration in the machinery, but everything was working beautifully, water-wheels, &c., and everything seemed as usual, except the main thing—they were short of the quantity of stone coming out of the mine, that formerly yielded such immense revenue to the company. This dificiency of stone is the consequence of the fire which took place in the mine; it did no good to anyone, and immense injury to thousands. Its origin, as far as I could ascertain, remains a mistery to everyone. We then went to two new shafts, sinking by all the force that can possibly be employed, down in a beautiful stratum of blue killas (giving it a mining term): good horse-whims and ropes, and every precaution preserved. They are in course of preparation to draw from these shafts with a water-wheel, and dispense with horses, which will be a great saving. We went to my friend's house early in the morning, being Christmas Day, but were kept awake by numerous choristers singing Christmas carols, which they continued nearly all day, accompanied by musical instruments, and preserving the best order. What was best of all, although there was abundance of spirits, wine, cake, and many other good things, I saw but one case of intoxication—this looks well. I found so many English woman and their families that it appeared more like an English colony than a foreign mine. Nice water brought to the doors, and good gardens, and everyone seemed to be comfortable, and living on good terms with his neighbours. Cornish people generally wish each other "A Merry Christmas," but here everyone was making merry. In one house I found seven children, some of course grown up, all singers and players, but they had lately lost their poor father. On Sunday we went to church, in a room belonging to the Casa Grande. The service was read by Mr. Gordon, the superintendent, who also delivered a very impressive sermon to a good congregation. On Monday I started for Taraquil Mine, distant about five miles from Morro Velho; got there all right, and found similar hospitality. While at breakfast, the superintendent, Mr. T. S. Treloar, rode by; begging my friends to excuse me, I went down and spoke with him. He knew me at once, although 17 years had passed since, when a lad, I took charge of him from Morro Velho to Rio, on his way to England. He got home safe and well, and I had not seen him until now. There is an immense deal of good permanent work done, and all will soon be in good working order. The habitations are good, and all the people seem to be getting on comfortably together.—JOHN ROBERTS: Morro di Tabaci (Braganza Gold Mining Company), Jan. 26, 1870.

THE SUPPLY OF SULPHUR.—Sicily has hitherto supplied the world with most of the sulphur it consumes, extracting it from the sides of Mount Etna, but a rival is arising in California. The sulphur works on Clear Lake produce all the Pacific Coast can consume—about 4 tons daily. Clear Lake occupies the crater of an extinct volcano, having a sulphur bed about eight miles from the southern end on the eastern shore, the bank resembling ashes, with numerous alkaline and sulphur springs and vent-holes, whence fumes issue, surrounded by crystals of pure sulphur. The earth, containing about 50 per cent. of sulphur, is placed in an inch retort, which is heated to a high temperature, so that the sulphur is driven off in fumes into a receiver, where it settles in a liquid form, and runs out into pine boxes 2 ft. long and 1 ft. square. It is as pure as the Sicilian brimstone, but the latter comes in sticks, which are more convenient for handling when small pieces are wanted. The adjacent country bears marks of volcanic action, the lake, the geysers, and St. Helena forming a triangle, each about 25 miles from the other two. The vent-hole fumes are now carried into a large chamber, where they condense into a flaky snow-like condition, and eight new quicksilver and sulphur mines have been opened up. As the three in operation employ over 300 men, it is calculated that the eight new ones will increase the number to 900, and give an enhanced value to the district. Not long ago Sicilian brimstone was consumed in California at a cost of 4 cents. per pound. Now, 2,000,000 lbs. of sulphuric, nitric, and muriatic acids are used, all of native manufacture.

London: Printed by RICHARD MIDDLETON, and published by HENRY ENGLISH (the proprietors), at their offices, 26, FLEET STREET, E.C., where all communications are requested to be addressed.—*May 7, 1870.*